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ERRATUM.

In p. 98, in first line of the note, *for* " which modify " *read* " yet observed to modify."

OBSERVATIONS

ON

VASCULAR APPEARANCES

OF

MUCOUS AND SEROUS MEMBRANES,

AS INDICATIVE OF INFLAMMATION.

By JOHN YELLOLY, M.D., F.R.S.,

PHYSICIAN TO HER ROYAL HIGHNESS THE DUCHESS OF GLOUCESTER, AND LATE PHYSICIAN TO THE LONDON HOSPITAL, ETC.

READ NOVEMBER 10TH, 1835.

MANY years ago, the Society did me the honour to insert in its Transactions, a paper on the Vascular Appearances of the Human Stomach, which are often mistaken for inflammation of that organ*. In that communication, my attention was principally directed to the various states of the mucous membrane of the stomach; and though I had occasion to advert likewise to the appearances of the villous coat of the intestines, and of their outer, or serous covering, it has long been my intention to offer to the Society, a few additional remarks on the appearances of membranous surfaces generally.

* Medico-Chirurgical Transactions, Vol. IV. p. 371. Published in 1813.

In the former paper, my object was principally to shew:

1st. That appearances of vascular fulness in the villous coat of the stomach, whether florid or dark-coloured, in distinct vessels, or in extravasations of different sizes, are not to be regarded as unequivocal marks of disease; inasmuch as they occur in every variety of degree and character, under every circumstance of previous indisposition, and in situations where the most healthy aspect of the organ is to be expected.

2d. That from the circumstance of such appearances being in many cases not preceded by symptoms of inflammation, many authors of great eminence were led to the conclusion, that gastritis might exist n the living body, without the indications of either pain or pyrexia; that it was a very common and frequent complaint, even terminating occasionally in gangrene, though there were no indications during life of its existence: and that the absence of the usual symptoms of inflammation of the stomach, when unequivocal marks of such inflammation were supposed to be found on dissection, could not but be regarded as a very remarkable, and puzzling circumstance.

3d. That the same misconceptions attached to intestinal vascularity; and that MORGAGNI himself, in order to get quit of the difficulty, was in some cases disposed to attribute the absence of pain, in inflammation of the bowels, to a paralytic affection, which took off the sensibility of the parts; but that, as this was a circumstance which could but seldom occur, he

came to the general conclusion, that pain and fever were not necessary for the existence of enteritis. HALLER, too, was induced to infer, from so uniformly finding vascularity in his inspections, that inflammation of the bowels was almost constant in every kind of fever, and was frequent in every other complaint.

4th. That the supposition of a necessary connection between vascularity and inflammation, has led to erroneous conclusions in many cases of sudden death, where the effects of putrefaction, and the spontaneous changes which the loss of vitality produces on the human body, were misunderstood, and sometimes confounded with the proper and necessary operation of poisons.

5th. That some diseases of a very obscure nature, as hydrophobia, have been considered as examples of gastritis, and plans of extensive depletion adopted for their treatment, merely from the villous coat of the stomach exhibiting appearances of vascularity, though there was no palpable difference between such vascularity, and that which is ordinarily seen where there had been no affection of the stomach during life.

6th. That such vascularity is entirely venous, though sometimes florid, and sometimes of a dark red; that it depends on a power capable of being exercised on the artery itself at the close of life, which carries on the blood to the veins, after the further supply of fresh blood from the heart is stopped; and that the branched or stellated form of vessels, under which the vascularity usually appears, is capable of

being imitated, whether by injection of the veins with fine injection, or by forcing back with the finger, or the back of a scalpel, the blood from the larger branches of veins into the smaller.

7th. That vascularity soon becomes diffused redness, by transudation through the coats of the containing vessels, just as happens with the bile in the gall-bladder, or in the speedy production of a blue colour, when the mesenteric arteries are injected with a solution of prussiate of potash, and the veins with that of green sulphate of iron.

8th. That digestion of the coats of the stomach after death, is by no means a common occurrence; inasmuch as extravasation does not take place in the great end of the stomach, however thin its coats may be, when fine injection is thrown into it, either by the superior coronary, or the splenic artery, as would be the case, if there were usually an erosion of the ends of vessels produced after death, by the action of the gastric juice, according to the opinion of Mr. HUNTER.

9th. That it is very difficult to ascertain, merely from the aspect of the vessels of a dead part, that they had been affected with inflammation during life, unless for the occurrence of unequivocal results of inflammatory action.

These are the views which I felt myself justified in taking, relative to the subject of vascularity, as referable to the human stomach; and, with certain modifications, they will apply both to *mucous* and *serous* surfaces generally.—Next to the stomach, it is in

the intestinal canal and trachea that vascularity is most frequently found; but it is in the two former, and more particularly in the stomach, that the greatest disposition to this sort of appearance takes place: for the softness and laxity of texture which distinguish the mucous surface of those parts, and which are admirably fitted for freedom of circulation, render such surfaces peculiarly permeable to vessels through their whole substance, and therefore eminently liable to vascular turgescence after death.

Serous membranes, on the other hand, are smooth, thin, and transparent, and allow vessels to be seen through them, without exhibiting them in their substance, as in mucous surfaces, unless in the inflamed state*. The separation of such membranes from the vascular surface beneath, is easily made, at least in the peritonæum and pleura: and the existence of inflam-

* Professor RUDOLPHI, of Berlin, is of opinion (Elements of Physiology, translated from the German by WM. DUNBAR HOW, M.D., Vol. I. p. 92) that serous membranes are to be viewed as merely affording coverings, like the epidermis, to the parts beneath, and an egress to serous fluid, just as the cuticle does to the ordinary exhalation of the skin. It does not appear to me, however, that the evidence which he brings forward in support of his views, is sufficiently decisive of the question, to invalidate the usual opinion entertained upon this subject; namely, that these structures possess minute and colourless vessels, which become apparent only under inflammation. DR. CRAIGIE makes some judicious observations on this subject in his review of KOLK'S "Observationes Anatomici-Pathologici et Practici Argumenti," in the 45th volume of the Edinburgh Medical and Surgical Journal, p. 511.

mation in them is readily detected, by the effusion of coagulable lymph which takes place in or upon them, very soon after its occurrence.

On the surface of the brain and cerebellum vascular appearances often occur, which, like those already mentioned, are principally the result of venous accumulation after death.

The *spinal marrow* is not the subject of convenient observation, and is therefore seldom inspected, except with some precise and determinate view. Its usual appearances are therefore but little known; but I have made them the objects of considerable attention, and have much reason to suppose, that a state of vascularity which is in no way morbid, has been sometimes regarded as imparting a certain character of spinal inflammation to some diseases of an obscure nature, as tetanus, which did not actually belong to them.

In my former paper I thought it expedient, in order to obtain a knowledge of those appearances of healthy stomachs which were the product merely of a particular mode of death, to give an account of the examinations of five malefactors who forfeited their lives to the justice of their country; and a plate which accompanies the communication, affords, in addition to some other sketches connected with the subject, a correct delineation of such appearances in one of them. I have, since that time, examined the bodies of several other persons who were executed, with a view to observe the vessels generally, and in particular the state of those of the spinal column.

The drawing which accompanies this paper, is a good example of the appearances in the spinal column of one of these cases, and may serve as an accompaniment to that above alluded to, which it very much resembles.

From this it may be seen, that a florid vascularity, communicating a scarlet hue to the whole column, is nothing more than venous turgescence, accompanied, as in the case of the stomach depicted in my former paper, with slight extravasation.

To those who have attended much to pathological inquiries, it must be obvious, that nothing is more important for the successful prosecution of morbid anatomy, than the habit of accurately connecting the phenomena which present themselves after death, with the symptoms which occur during life; and of carefully distinguishing between the varieties of form and appearance which exist in healthy parts, and such as are the result of derangement or disease.

Very careful attention and discrimination are invariably required on this subject; and even with all the aids which the most accurate knowledge, and the most extended experience can communicate, it is not always that the best qualified pathologist feels himself justified in speaking with decision, as to the nature of certain appearances which come before him.

This is particularly the case with *inflammation*, a subject of the highest importance in pathology; for while on the one hand, it either constitutes or gives rise, in some one or other of its various seats and forms, to many of the most important diseases, it is

likewise on the other, one of the principal agents by which injuries are repaired, and maladies prevented; thus affording an interesting example, which the well directed studies of modern times have so successfully elucidated, of the provident mode in which nature employs her resources, and aims at accomplishing as many ends as possible by the same means. The subject of inflammation is very extensively interwoven with medical reasoning and practice. Where its existence is well marked, we have an important guide in our curative indications; and even its fainter appearances may exercise some portion of directing influence on the treatment of disease*.

The phenomena of redness, swelling, heat, and pain, sufficiently indicate the existence of inflammation in external parts; but in affections of internal organs, we are often led to our conclusions by imper-

* In the fifth volume of the Mémoires de l'Académie Royale de Médecine lately published, are some observations on the cure of wounds *without inflammation*, by DR. MACARTNEY, the distinguished professor of Anatomy and Surgery in the University of Dublin, which, if fully established, would affect much the prevailing ideas on the subject. In this communication we are informed, that DR. MACARTNEY has for more than thirty years been of opinion, that inflammation retards the healing of wounds when moderate, and entirely prevents it when very considerable; that the proper means of treatment are, to soothe a wounded part as much as possible, by repose; by the absence of every kind of irritation, and by the application of water or vapour of regulated temperature; and that, when by these means inflammation is prevented, a cure takes place without that deposition

fect analogies, and by symptoms and appearances more or less doubtful. Sensations themselves are, to a certain degree, deceptive or equivocal. They may be connected with very different states of body, and may be very dependent on the temperament of the patient by whom they are described. In internal diseases, we are by this means often left to form our conclusions, as to the existence of certain states of disease connected with the extinction of life, by the appearances offered on examination after death.

Where inflammation has existed *externally*, death makes a very important alteration of appearance. The redness goes off, except where effusion has taken place, and the remains of it are seen; while the tumour sinks, except in as far as any deposition in the cellular membrane has taken place, and may render it permanent. These particular changes are necessarily owing to the altered state of the blood-

of coagulable lymph, which is necessary to ordinary healing by the first intention. The communication is of great practical importance, but if DR. MACARTNEY'S opinions are correctly represented, (of which, from some observations made by him in the Medical Gazette, there is some reason to doubt,) I should feel much difficulty in adopting the conclusion, that irritation, under the circumstances of injury mentioned by him, could ever be so far prevented or repressed by medical treatment, as to preclude altogether the effusion of coagulable lymph from divided vessels. It is easy to conceive, that a very small portion of that deposition, may be a sufficient bond of union under the favourable position contemplated, but not that it should be entirely wanting; which would appear to me to involve the anomaly of a change of law, in circumstances very nearly approximating to each other.

vessels after death, when both the arteries and veins have parted with their contents, and left the parts to which they belonged nearly exsanguous.

But in the *internal* organs, and more particularly the abdominal viscera, various modifications take place, from the peculiar situation which these parts occupy in the animal body. Being nearly connected with a double series of venous structure, that of the liver, and that of the heart, in which a considerable portion of the blood is concentered after death, a retarding or obstructing cause operates on the veins which belong to them, and which, added to the softness of texture to which I have already alluded, very generally produces more or less fulness of the vessels, and thus an appearance of more or less vascularity, both on the external and internal surfaces of the chylopöietic viscera.

It may be readily seen, therefore, that vascular fulness in the dead body is exceedingly delusive, and cannot usually be regarded as any indication of what was the state of vessels during life, where both arteries and veins bear their part in the circulation, and where there are none of the causes of accumulation in the lungs or heart, or in the vena cava or vena portæ, which take place at the close of life. Under this view of the subject it is likewise apparent, that though a florid state of vessels after death has often been regarded as a proof of arterial congestion, yet it merely arises from the arterial character of the blood remaining in the veins, for some time after its transmission from their continuous arterial capillaries.

Since the time when my former paper was published, many years have elapsed of a more active and general cultivation of every branch of medical science, than any similar period ever before witnessed. The consequence has been favourable; and as far as morbid anatomy is concerned, a more correct knowledge has been thus obtained, of the nature and indications of disease; and many misconceptions on the subject have been cleared up, or removed. Few of the pathologists of this country are now, therefore, disposed to consider mere turgescence of vessels as indicating inflammation; and they consequently look to some of the results of inflammatory action, for proofs of its existence in internal parts.

The enterprise and energy of continental, and particularly of French physicians and surgeons, during the same period, have not been less marked and creditable; but it is only of late years that their attention has been applied very strongly to the importance of a correct discrimination relative to the vascularity of membranes, to which I directed the attention of the professional public, through the medium of our Transactions. There are still, however, as it appears to me, opinions entertained relative to this subject, by gentlemen of much character and influence in the profession, which do not altogether accord with the present state of pathological knowledge; and on these it is proper that I should offer some observations.

The frequent appearances of vascularity which exhibit themselves in the examination of bodies, have had a powerful influence in forming the pathological opi-

nions of two distinguished physicians of the present day, TOMMASINI and BROUSSAIS. Both these gentlemen feel themselves warranted in concluding, that general fever is to be attributed to local inflammation alone; that it is never to be viewed as an idiopathic disease; and that it consists of an assemblage of symptoms, depending on the operation of such local affection on the constitution. The vascularity frequently observed in the lining membrane of the stomach and intestinal canal, BROUSSAIS regards as gastro-enteritic inflammation; and as this is generally seen on examining the bodies of persons affected with fever, he has been induced to conclude, that fever depends, in all cases, on inflammation of the gastro-enteritic mucous membrane.

TOMMASINI, on the other hand, though he considers fever, equally with BROUSSAIS, as produced by inflammation, regards its seat as in the brain. But he carries his opinions as to the extensive bearings of inflammation, in the production of disease, so far as to believe, that much the greater number of maladies affecting the human body arise from *inflammation*, either acute or chronic, apparent, deep seated, or concealed, and of various extent and relation; and that this is particularly the case with many obstinate convulsive affections; with hysteria, tic douloureux, sciatica, and the different forms of neuralgia, in many of which stimulant and sedative remedies have been given in vain *.

* TOMMASINI'S Précis de la nouvelle Doctrine médicale Italienne, &c., traduit de l'Italien, par P. L. VANDER LINDEN, p. 69. Paris, 1822.

In considering the application of these doctrines in pathology, whether in their more limited or extended view, it has been a natural object of inquiry with the best observers, whether the appearances of inflammation which were represented as thus exhibiting themselves, were original, necessary, and constituent parts of the disease, or were only accessory and occasional. There is much reason for believing that the latter is the fact; but though there is no doubt, that both in fevers and many other complaints, unquestionable marks of inflammation are occasionally found in various organs of the body, and particularly in the intestinal canal and encephalon, yet it is an important subject of consideration, in connection with the present paper, whether the indications of inflammation mentioned by those gentlemen and their supporters, as so often occurring in morbid dissections, are always to be viewed as unequivocal, or as being frequently nothing more than turgescence or congestion of vessels.

Tommasini informs us, that in the examination of one hundred cases of fever, the brain exhibits undoubted marks of inflammation in at least ninety of them*; but he does not mention the appearances on which his inferences as to the existence of inflammation are founded. If those appearances were the

* "...si l'on consulte les résultats des dissections pathologiques et si l'on apprécie bien les faits que chacun de vous aura sans doute pu observer; l'on voit que, sur cent morts de Typhus, ou de Fièvre nerveuse, quatre vingt-dix au moins nous présentent dans le cerveau les traces manifestes et les résultats d'une véritable inflammation."—Tommasini, p. 72.

unquestionable and necessary results of inflammation, the correct pathologist could have no difficulty in admitting his conclusions; and it would indeed be a matter of great surprise, that there should be any hesitation in acknowledging them, with such weight of evidence in their support. But my own knowledge of the appearances of the brain in fever patients, and the descriptions given by those whose opportunities of observation on the subject have been very extensive, lead me to doubt, whether the appearances in question consist in more than turgescence of vessels, between which, and inflammation, it is of such high importance to discriminate.

In reference to this point, M. ANDRAL states his belief, that there are no characters by which it can with certainty be ascertained, whether the sanguineous injection often observed in the brain, is the result of inflammation, or cerebral congestion; and he adds, "that simple congestion often passes insensibly into inflammation, a circumstance which is not peculiar to the brain, for it is not always possible to distinguish positively between mere engorgement of the lungs, and recent pneumonia. In typhus fever of every form," he continues, "the nervous system acts a very important part; there is disturbance in the brain, as well as in the alimentary canal; but inflammation is no more necessary in the one, than the other." *

* La Lancette Française, Gazette des Hôpitaux civils et militaires pour Dec. 8, 1835. Med. Gazette for Jan. 9, 1836.

The zeal and ability with which M. BROUSSAIS has propagated his opinions, and the seductive influence of doctrines, which promise a ready and unhesitating removal of previous difficulties, seem to have led to an extensive reception of the deductions of that eminent physician, in respect to the dependence of fever on gastro-enteritic inflammation.

In the early period of his professional labours, M. ANDRAL, to whom the world is greatly indebted for the industry and talent of his pathological researches, appears to have been under considerable influence from the opinions of M. BROUSSAIS, which greater experience, and larger opportunities of observation, have enabled him, in some degree, to modify. His favourable impressions were, indeed, from the first, blended with considerable distrust of the extent to which BROUSSAIS' opinions could fairly be admitted; but in examining, with care, the dissections of fever cases contained in the 1st volume of his Clinique Médicale, (which are thirty-eight in number, the whole number of cases described being 117,) it will, I think, be seen, that notwithstanding the general precision and correctness which they exhibit, some of them are described as examples of gastro-enteritic inflammation, which can scarcely be regarded but as instances of congestion *.

The brown spots too, which are mentioned as indi-

* In Case 82, Tom. I. p. 186, it is said, that the stomach itself presented a *moderate degree of inflammation*, " mediocre degré de phlegmasie ;" but the appearances, as given at p. 185,

cative of inflammation *; and the greyish brown tint ("teinte de gris brunâtre") of gangrene, will be readily recognized as resembling much that transudation through the coats of veins, which a short time generally suffices to produce after death †; while the follicles which not unfrequently present themselves in va-

and at p. 358, are merely those of injection of the pyloric portion; "la portion pylorique était fortement injectée."

Case 95, p. 268, is mentioned as an example of a "Gastrite intense" attributed to the use of cinchona, and evinced by the occurrence of dryness of tongue about four days before death. But the appearances are those of injection only: "La membrane muqueuse dans la presque totalité de son etendue était *rouge* et *molle*."—p. 266.

Case 107, p. 316, is spoken of as an instance of gastro-enteritic inflammation occurring at the latter period of life; while the appearances are only those of injection of the mucous coat, "La muqueuse elle-même était injectée mais non uniformément rouge," with the large veins below filled with black blood, "remplies de sang noir."

In Case 113, p. 338, "une longue ribbande *rougeatre* formée par des *vaisseaux injectés*, autour des quels existait de petits *points rouges*," is mentioned at 339 as "une *gastrite partielle* peu intense."

In Case 114, p. 339, a "petite plaque rouge dans l'estomac," is viewed as having a contingent connection with gastro-enteritis, p. 344.

In Case 115, p. 344, we learn that the pulse only became frequent during the two days previous to death, notwithstanding the inflammation of the digestive canal; but the appearances are merely those of the stomach "generalement injecté, à sa surface interne;" and at the posterior part of the great curvature, having "plusieurs plaques d'un rouge brunâtre," &c.

* ANDRAL'S Clinique Médicale, Tom. I. Case 89, p. 223.

† Ib. Case 97, p. 277.

rious parts of the stomach, may easily be mistaken for the minute ulcerations of the size of an ordinary pin's head, which are stated by M. ANDRAL to be occasionally seen in the villous coat of that organ *. It might readily, however, be ascertained, whether, at the place where ulceration was supposed to exist, the vessels were actually divided, so as to admit the passage of injection through their open extremities, in the manner which I have mentioned, as affording a ready means of determining the existence of digestion of the stomach after death.

In order to exemplify the occurrence of such follicles, I have the honour to transmit, for the inspection of the Society, a very interesting drawing of a stomach, which SIR ASTLEY COOPER was so obliging as to get made for me many years since, and to which I alluded in my former paper; in which there were found a great number of depressions of various sizes, which a superficial examination might refer to ulceration, but which we found to be natural depressions followed by the mucous covering. The patient had no symptom of stomach-disease.—Notwithstanding, however, the occasional slight deviations from precision, which I have had occasion to notice in the Clinique Médicale, M. ANDRAL inculcates, in various parts of that valuable work, the importance of not mistaking congestion of vessels for the result of inflammatory action, as appears to have been so

* ANDRAL's Clinique Médicale, Tom. I., Case 97, p. 277.

uniformly done in BROUSSAIS' system, as well as in that of TOMMASINI.

In M. ANDRAL'S later and more peculiar work*, the Précis d'Anatomie Pathologique, the distinctions between congestion and inflammation are more pointedly laid down and systematized, and are made to occupy a more prominent position than they possessed in the occasional remarks of the Clinique. In this work, he rejects the term *inflammation* as old-fashioned, vague, and confused; though I would submit that there is nothing more inconvenient than to part with an appellative which has been long accredited and understood. That its etymology may not be in exact accordance with its present signification, is necessarily the case with much of the language even of science. But we should gain little in precision by the employment of the designation which M. ANDRAL would substitute, that of *Hyperémie active* ou *sthenique;* nor does he appear to be at all able practically to follow up, either in his Précis d'Anatomie Pathologique, or in the Clinical Lectures which lately appeared in the Gazette des Hôpitaux, the abandonment of the term which he has deemed it proper to condemn.—Congestions, under whatever circumstances they may arise, he regards as forming other descriptions of hyperemiæ, as the *Hyperémie passive* ou *Asthenique*, when there is a diminished

* M. ANDRAL'S Clinique Médicale, was based on a report of cases visited by M. LERMINIER, at the Clinique of La Charité.

tone in the capillary vessels; *Hyperémie mécanique*, when there is an obstacle to venous circulation; and *Hyperémie cadaverique*, which occurs after death.

In considering the last division of the hyperemiæ, the *Hyperémie cadaverique*, his deductions are very analogous to those arrived at in my former paper, both as to the cause of such congestions, (which he imitates as I have done, by pressing back the blood contained in the veins into the capillaries, by the back of a scalpel;) the circumstances under which they occur, and their liability to be mistaken for morbid appearances. He considers it as established by his observations, that the hyperemiæ which have come on during life, or after death, are not always to be distinguished from each other by their anatomical characters; and that simple inspection does not, in a great number of cases, suffice to determine the cause of sanguineous congestions found in pathological examinations *. The gastro-intestinal membranes, he continues, may be indifferently white or red, according to the circumstances under which death has taken place; but as the circumstances which produce a red colour are most frequent at the close of life, it will

* "Telles sont les differentes classes d'Hyperémies survenus pendant la vie ou après la mort, dont une rigoureuse observation me semble démontrer l'existence; et s'il est vrai, comme je l'ai établi qu'elles ne se distinguent pas toujours les unes des autres par les charactères anatomiques bien tranchés, il devient manifeste que dans un grand nombre de cas, il ne suffira pas de la simple inspection pour décider qu'elle cause a produit les congestions sanguines trouvées sur un cadavre." ANDRAL'S Précis, Tom. I. p. 68.

oftener happen, that congestion of vessels in the alimentary canal will be found in the dead body, than a want of colour. It does not follow, however, he adds, that a red colour is any proof that disease existed in the alimentary canal during life; inasmuch as an intestine found to be red in the dead body, was not necessarily so during life *.

M. ANDRAL attributes the position of intestinal congestion, with Messrs. TROUSSEAU and RIGOT, to the mechanical descent of the fluid blood, according to the posture which the body is made to assume after death; and in one case, where the vascularity was in the anterior part of the stomach, owing to the body lying on its back, he was disposed to refer the appearance to *gastritis*, which, with much candour, he states he should not do now †. That this cause operates, to a certain extent, in producing the phenomenon in question, particularly when the larger

* —"La membrane muqueuse gastro-intestinale peut-être indifféremment blanche ou rouge, sans que l'une ou l'autre de ces couleurs indique nécessairement que la membrane soit dans un état morbide; elle est ou blanche ou rouge, à divers degrés, selon qu'avant la mort a existé l'une ou l'autre des conditions soit mécaniques, soit organiques, soit vitales, que nous avons cherché a faire connaître. Or, comme, parmi ces conditions celles qui en déterminent la colorisation rouge existent le plus fréquemment, il s'ensuit que sur la cadavre on doit plus souvent rencontrer l'injection du tube digestif, que son état de décoloration." ANDRAL's Précis, Tom. II. p. 10.

† "Je crus alors qu'il y avait *gastrite*; je ne l'affirmerais pas aujourd'hui."

vessels are concerned, is quite certain; but, though I have remarked, that vascularity is found "principally in the posterior part of the great end of the stomach, and in the lesser curvature,"* yet nothing is more common than to see great turgescence of vessels on the upper surface (in relation to the position of the body) both of the intestines and brain; and it occurs everywhere in the minute vessels of the inner membrane of the stomach and bowels, where an attraction is exercised between the coats and their contents, which prevents any material change of position in the latter.

M. ANDRAL is disposed to refer the transudation which takes place through the sides of vessels some time after death, to *putrefaction*†. But I see no reason to alter the opinion which I have expressed on this subject, namely that "putrefaction will doubtless increase, but it does not seem at all *necessary* to transudation."‡ The animal fibre has a power to resist the passage of a fluid during life; but very soon after death, and long before putrefaction can be considered as having at all taken place, the power is lost, and various well known phenomena speedily occur in every part of the body, which are dependent on that unknown and inscrutable change, which the loss of vitality has effected in the animal machine. Transudation of bile from the gall-bladder, and of

* Medico-Chirurgical Transactions, Vol. IV. p. 388.

† ANDRAL's Précis, Tom. II. p. 15.

‡ Medico-Chirurgical Transactions, Vol. IV. p. 398.

blood into the thoracic or abdominal cavities, are among the commonest examples; and the veins of the stomach and bowels will exhibit the same appearance in a day, or day and a half from death; but in a still shorter time if an inverted vascular stomach is extended upon a flat surface, and kept moist and undisturbed. I may mention too, as an additional proof of the same circumstance, the point mentioned at page 4 of this communication; and may add, that the same will happen in a tied carotid artery or intestine, containing either of the fluids employed, and made to dip into a vessel containing a portion of the other *.

It would lead me much beyond the limits which I have prescribed for my present communication, to enter into a particular examination of the opinions which M. ANDRAL entertains, as to the existence of organic affections of the stomach generally, and their connexion with complaints of the chest and encephalon. It appears to me, however, that his deductions as to the extent to which inflammation of that organ prevails, whether acute or chronic, original or accessory, are not warranted, either by the symptoms which he narrates, or the phenomena described by him as appearing after death. That the stomach should exhibit functional disease more frequently than any other organ of the body, is not at all surprising, when we consider, not only its remarkable sympathy with every part of the animal œconomy, and its liabi-

* Medico-Chirurgical Transactions, Vol. IV. p. 398.

lity, therefore, to be more or less affected in all kinds of complaints, but its unceasing employment, and its perpetual exposure to the somewhat unreasonable duties, which the habits of society are so frequently apt to impose. That it should, however, be subject to the large amount of organic affection mentioned by M. ANDRAL, is not only, as it appears to me, an error in pathology, but would seem to indicate that this viscus, so essential to the support of life, and so remarkable for its power of accommodation to every variety of food, is devoid of much of the conservative faculty with which the animal body is so eminently endowed, and is continually liable, to a much greater extent than most other organs, to have its peculiar and important functions injuriously and permanently disturbed.

M. OTTO appears to have attended much to the appearances of vascularity after death, and is of opinion that the "reddening of particular viscera, in persons who have died of adynamic fevers, which BROUSSAIS and TOMMASINI have considered as a sign of inflammation," as "not in the least so, but the consequences of mere irritation, congestion, obstruction, &c."* At the same time he mentions, as of great importance, "*occult* or *hidden* inflammations, so called, which are seated especially in the viscera of the three great cavities of the body, and during life often exhibit no distinct or determinate symptoms."

* OTTO's compendium of human and comparative Pathological Anatomy, translated by SOUTH, p. 47.

Whether such cases were connected with ulceration, or the deposit of some unequivocal product of inflammation, we are not informed; but if such were not the case, it would be difficult to regard them in any other light, than as mere examples of vascular turgescence.

MM. TROUSSEAU and RIGOT, and M. BILLARD have turned their particular attention to the nature of the vascularity which is found after death. The former, in a memoir published in the Archives générales de Médecine *, give many interesting details on the subject; and shew, by careful investigation, not only that the redness so often observed in the mucous membrane of the lungs and alimentary canal, comes on subsequently to death, and is independent of disease; but that this is likewise the case with the redness seen in the inner membrane of the blood vessels and heart.

M. BILLARD has, with much zeal and industry, prosecuted a long and laborious inquiry into the gastro-intestinal mucous membrane in its healthy and diseased states, and during every period of life †.

He admits the difficulty of discriminating accurately between inflammation and passive congestion of the alimentary tube; and describes, very correctly, and at great length, the various appearances which

* For October and November, 1826.

† De la Membrane Muqueuse gastro-intestinale dans l'état sain et dans l'état inflammatoire; ou Récherches d'Anatomie Pathologique sur les divers aspects sain et morbides qui peuvent presenter l'estomac et les intestins. Par C. BILLARD.

this passive state of congestion assumes; but at the same time he considers the redness which many anatomical writers describe as being ordinarily found in the villous coat of the stomach and bowels, as only existing when death may have occurred during digestion*. It may be remarked, however, that though the stomach, as a living secreting organ, becomes redder during digestion, by having an augmented distribution of blood through both the arteries and veins of its secreting surface, yet this is no criterion of the state of things after death, when its arteries become entirely empty, and its veins often nearly so.

In considering the circumstances occasioning what he terms passive congestion, M. BILLARD does not seem to recollect that such circumstances occur under almost every kind of death; and hence he reprehends, and, as it appears to me, somewhat unduly, the opinions of many of the best anatomists, and most correct pathologists of his country, such as HABICOT, SABATIER, PORTAL, and BOYER, who have all of them offered a very judicious and appropriate caution, against mistaking a congested state of vessels for an inflamed one †.

* "Je n'ai trouvé cette coloration rouge, ou plutôt rose, de l'estomac, ou du duodénum, que sur des cadavres d'individus *morts pendant la digestion*."—BILLARD, p. 95.

† Of SABATIER, M. BILLARD says, "Sabatier indique a tort la couleur rouge pourpre, comme étant naturelle à la membrane muqueuse de l'estomac. Il partage, en cela, l'erreur du célèbre chirurgien," (Habicot,) "dont il emprunte l'opinion." But Sabatier only says, "Le grand nombre des vaisseaux qui s'y distribuent lui *donnent souvent* une couleur pourpre obscur,"

In adverting to the present state of pathological opinions relating to vascularity, it is particularly satisfactory to me to find, that there is so much accordance between my own conclusions, and those which have been arrived at by gentlemen, who have availed themselves, so sedulously, of the ample field of pathological investigation which they possess in a neighbouring kingdom. It would have saved them, however, much labour, and perhaps, to a certain degree have modified some of their deductions, had they been so far acquainted with our Transactions, as to have known what had been done in this country on the same subject. Life is, indeed, too short, and the difficulties which attend the prosecution of philosophical inquiries too considerable, to afford that there should be no division of labour in science; and that men of talents and energy should occupy themselves in investigations which have already been prosecuted in other quarters, without being aware of what has already been done on the same subject. Science

which is the fact. I have quoted in my former paper, the original and discriminating remark of HABICOT on this subject, which M. BILLARD seems to have entirely misconceived. The passage is as follows: "La partie interieure d'iceluy vētricule estāt nettoyée demōstrerez, tant la tunique interne qui est velontée, et comme l'abondissemēt qui se faict des vaisseaux provenās de la vene gastre epiploïque en la partie gibbe dudict vētricule, le rend de couleur noirastre, qui a faict croire à beaucoup d'inexpert, en la medicine et chirurgie, aux maladies violentes y avoir en poison ou venosité en leur mort." HABICOT NICOLAS, Semaine ou Practique Anatomique, p. 48, leçon 3, Paris 1610.

is common property, of which every one may avail himself at his pleasure; but the talents of able men belong also in a certain degree to the public; and it is a species of duty for such as are qualified, by their abilities and industry, to enlarge the boundaries of science, to employ themselves in the most provident manner possible for the common benefit*.

The study of the phenomena, and various results of inflammation, has been very successfully prosecuted by modern pathologists; but still it has not been sufficiently ascertained, on what circumstances the peculiar affection depends, which constitutes unequivocal inflammatory action. The general suffusion of a blush, the increased colour produced by exercise, or by rage, and the flush of hectic fever, all of them resemble much the first appearance of erysipelas; but

* Considering the almost national character of the Medico-Chirurgical Transactions, it is very remarkable how little they seem to be known among the best French medical writers, even in reference to some of our most distinguished names. A curious exemplification of this occurs in CRUVEILHIER, who informs us, in the 3d livraison of his Anatomie Pathologique, (pl. 6, p. 10) that he lately made a very convincing experiment ("une experience bien convaincante"), to prove, that disease on one side of the spinal marrow, produces its effect on the same, and not the opposite side of the body. But the point had been examined many years previously by SIR ASTLEY COOPER, at my request, in consequence of the contradictory evidence on the subject; and a similar conclusion, confirming a valuable experiment of GALEN, arrived at by direct experiment on a dog, of which an account was published by me in the first volume of the Medico-Chirurgical Transactions, p. 197.

no length of continuance, nor frequency of recurrence of these phenomena, will give them at all the character of inflammation; while the slightest efflorescence may, in erysipelas, go on progressively, to the exhibition of all the local, as well as the general characteristics of that disease.

The local congestions which are apt to occur in various parts of the body, from slight causes in certain habits, neither constitute inflammation, nor give origin to it. They may produce effusion in the head, and in this way occasion the most serious apoplectic, or paralytic affections; or they may occasion discharge of blood from the lungs, or Schneiderian membrane; but they do not give rise either to phrenitis, or pneumonia; nor is that state of vessels which in the stomach occasions hematemesis, and in the large intestines hæmorrhoidal discharge, productive of gastritis, or of inflammation of the bowels.

Mr. HUNTER saw and entered into these difficulties; for in speaking of the vascularity of membranes, he remarks, that there is no difference between the blush which belongs to "briskness in the circulation in the part at the time," and "the very first step in inflammation"; that both are connected with a certain "action of the vessels"; and that when this blush is "an effect of an inflammatory cause, *it is then only that the inflammation has not yet produced any change in the natural structure of the parts, but which it will soon do.* What the action is," he continues, "or in what it differs from

the common action of the vessels, is not easily ascertained, since we are more able to judge of the effects than the immediate cause."*

Not much has yet been done to remove the obscurity of the subject; but the important influence which modern physiology has referred to the nervous system, in secretion, has been considered, and with much appearance of truth, as applicable to the production of that peculiar change in the action of vessels, on which depend the more characteristic phenomena of inflammation; and, in particular, the property acquired by inflamed vessels of throwing out coagulable lymph.

The existence of pain in an inflamed part, has, from the earliest periods, been regarded as one of the characteristics of inflammation; and this symptom not unnaturally, therefore, refers itself, and the phenomena connected with it, to some affection of the sensorium. But degrees of pain are very various, according to the character of the part affected; and even the total absence of sensibility is, in some cases of anæsthesia, found to be not incompatible with the existence of the other phenomena of inflammation. The circumstances which produce pain are likewise very obscure. Distension will not alone give rise to it; for in all the states of congestion to which I have alluded, pain is neither a frequent, nor a necessary attendant. Under a great variety of circumstances, likewise, pain can be present without inflammation,

* HUNTER's Treatise on the Blood, Inflammation, and Gunshot Wounds, p. 281.

of which headache, gastrodynia, and the peculiar state of bowel which exists in colic are well marked examples, to say nothing of those diseases which are denominated more particularly neuralgic. For distension, therefore, to produce pain, it must exist in a part otherwise disposed to it; and of the peculiar nature of this disposition we are at present entirely ignorant.

In mentioning the existence of doubts as to the amount of our acquaintance with particular subjects, to which my inquiries into the vascular appearances of membranes have so much led me, the task, I am aware, is somewhat ungracious; for it is much more agreeable to refer to the possession of knowledge, than to hesitate in admitting its extent or application. But though there may be many, as DECANDOLLE well observes, "qui aiment à embrasser des hypothèses hardies, au risque même des erreurs," rather than submit to the feelings of suspense and indecision which arise from the difficulties which there often are in forming correct conclusions, yet in no branch of science is it more important, and perhaps less easy, than in Pathology, to restrain or to temper the love of speculation, and to guard against its powerful influence.

HISTORY

OF A

REMARKABLE CASE

OF

VARICOSE ANEURISM,

WITH OBSERVATIONS.

By JOHN GEORGE PERRY,

SURGEON TO THE FOUNDLING HOSPITAL, AND TO THE ST. MARYLEBONE INFIRMARY.

READ NOV. 24TH, 1835.

THE subject of varicose aneurism has been lately so fully and ably treated by M. Breschet*, and its pathology has received from him so much patient and acute investigation, that the present state of our knowledge furnishes little which can be added to his history of the disease. A fact, however, has lately come under my observation, which is not adverted to as even possible, either by M. Breschet, or any preceding writer that I am acquainted with, and which, from its practical importance, seems to me of sufficient moment to be made the subject of a separate communication to the Society.

* Mem. de la Société Royale de Médecine, T. III. p. 198 et seq.

All writers on this disease, from Dr. Wm. Hunter, who first described it, to the celebrated surgeon I have already alluded to, seem to have regarded a wound of the vessels by some penetrating instrument as a necessary preliminary to the establishment of that permanent channel of communication, through which the intervascular transfusion ever afterwards takes place; indeed, the previous wound is in all instances assumed, as a necessary condition, in the definition of the disease. "Il faut," says M. Breschet, "que la veine accompagnant l'artère, et qui est accolée à ses parois soit traversée de part en part, avant que l'instrument atteigne l'artère." Such a definition was undoubtedly quite borne out by all the cases hitherto recorded; and the great indisposition manifested by blood-vessels, and especially veins, to partake of the ulcerative process, even when it may have involved all the surrounding tissues, rendered it very improbable that an opening would take place in the coats of one of the last mentioned vessels from any of the ordinary causes of absorption. Aneurisms of large arteries have often been seen to cause, by their pressure, absorption of all the solid structures around, without their accompanying veins becoming, in any degree, involved in the general havoc. The case which is about to be related to the society, however, will suffice to prove that such laws, though of *general*, are not of *universal* application.

Jonathan Allum, ætat. 47, in the early part of his life was a private of dragoons, and served in the Peninsular war. He was never a very strong man,

and was discharged from the army in the year 1819, on account of general ill-health. He had no recollection of any accident having occurred to him except one, a few years before he left the army, when he and his horse were knocked down by the fall of a heavy piece of timber. His left knee was much hurt at the time, and had never since been as strong as the other, and sometimes had been so painful as to lead him to apply for surgical assistance at the infirmary.

In the year 1831, being at that time employed in drawing a truck, he suffered for several months from pain in the foot, at its inner side, and matter formed, and was discharged from that part. Sometime in the course of the same year he first perceived a small swelling a little below his left knee, but it gave him no pain and he disregarded it. The swelling increased very slowly in size and troubled him very little, that he could recollect, for two or three years, except that occasionally, when drawing his truck, he was seized with pain in it to such a degree as to be obliged to stop for a few minutes from his work.

About two years after the first discovery of the tumour, his wife accidentally perceived a *palpitation* (to use his own phrase) in the middle of the left thigh, which alarmed *her* very much, as she connected it in her mind with a palpitation he was then subject to about his heart, and which was sometimes so violent, as to prevent him from doing any work. The patient himself, however, suffering no inconvenience from the condition of the thigh, paid no attention to it. The *palpitation* in the thigh went on increasing,

as did also the swelling in the leg, nothing being done for their relief until Feb. 6th, 1834, when he applied for admission into the infirmary, chiefly on account of pain which had come on again in the inner side of his foot and great toe, and which he considered his most severe complaint.

Upon examination soon after his admission, an aneurismal tumour of considerable size was discovered at the upper part and inner side of the calf of the left leg, apparently occupying the lower end of the popliteal, or the commencement of the posterior tibial artery. The contents of the sac were so entirely fluid, that it could be almost emptied by pressure with the hand, maintained for a few minutes. Pulsation could be felt distinctly in the anterior tibial artery as it passed over the tarsus, and obscurely in the posterior tibial, behind the internal malleolus.

As the patient lay on his bed with the limb placed on its outer side, a very remarkable pulsation could be distinctly *seen* along the course of the femoral artery and vein throughout the greater part of the upper two-thirds of the thigh, beginning about two inches below the crural arch, and terminating at the spot where the femoral vessels become included in the tendinous sheath formed by the triceps muscle. When the hand was laid upon any part of this region a very peculiar thrilling was perceived, occupying a space of at least two inches on either side of the vessels, but varying in intensity and force according to the distance of the part examined from them. I know not how to describe the sensation communicated

to the hand better than by borrowing a simile from Laennec *, who, in describing the sounds attendant on a contracted state of the left auriculo-ventricular opening, says, "on sent quelquefois à la main un frémissement analogue à celui qui accompagne le murmure de satisfaction que font entendre les chats, lorsqu'on leur passe la main sur le dos." This purring (to adopt his phrase) was quite distinguishable from the pulsation of the artery; for while the latter was lost in the intervals corresponding to the diastole of the heart, the former continued to be felt without intermission, deriving only renewed intensity from the repetition of the heart's action.

Various suggestions were offered by the many experienced surgeons who, in addition to my colleagues, did me the favour to examine the case with me, with the view of explaining the phenomenon I have endeavoured to describe. Some supposed it to be occasioned by an unusual condition of the lining of the artery; others attributed it to the dilated state of the vessel; whilst another gentleman ascribed it to the escape of blood from the artery into the sheath of the vessels, which he supposed might have there formed an elongated aneurismal sac. Notwithstanding the difference of opinion which prevailed as to the nature of the affection, these gentlemen all coincided with me in opinion, that the diseased state of the vessel rendered it inexpedient to place a ligature upon it, until the increase of the tumour in the ham should

* Traité de l'auscultation médiate, Tom. II., p. 215, 1st edit.

have brought the patient's life into immediate danger. Neither did the ligature of the external iliac artery promise a more successful event, since its pulsation could be felt and heard over so wide a space, that it also was conceived to be greatly dilated, if not decidedly aneurismal.

In one of the many examinations I made of the limb during the patient's residence in the infirmary, I chanced to discover, that by pressing the point of my finger upon a part of the artery immediately before it entered the sheath of the triceps, I could entirely stop the purring, without interrupting the circulation through the vessel. This discovery having naturally suggested the idea of the existence of a communication at this part between the artery and vein, the patient was very closely interrogated, to ascertain whether he had ever suffered a wound in that situation. He, however, constantly denied that he had had any such accident: neither was any scar visible on the skin.

It having been decided that no operation should, in the present circumstances, be attempted for the relief of the disease, the general treatment during the patient's sojourn in the infirmary, was confined to such means as were best calculated to diminish the force of the circulation, while rest in the recumbent posture was most strictly enjoined. For some time after his admission, pressure, by means of a bandage extending from the foot nearly to the groin, was attempted to be maintained, but it was eventually discontinued on account of the uneasiness it occasioned.

For this was substituted the more circumscribed pressure of a spring, resembling a truss, having at its extremity a small pad, intended to imitate as nearly as possible the pressure of the point of the finger, which was so effectual in restraining the purring. It was hoped by the employment of this instrument to effect obliteration of the presumed communication between the vessels, and thus to induce such a condition of the parts, as would justify the having recourse to the ligature of the femoral artery, for the cure of the aneurism in the ham;—whilst it was thought possible that the retardation of the circulation through the artery might even afford occasion for the natural cure taking place in the sac.

After a residence of nine months in the infirmary, as no change was observed in the condition of the diseased parts, the patient was permitted, at his urgent request, to return to his home, promising that he would there continue the employment of the means just described, and he was accordingly discharged on the 24th of November, 1834, from which time until September last he was regularly visited by the assistant-surgeons of the infirmary. During this interval I occasionally saw him and could perceive no change in the size or other characters of the popliteal tumour, but the purring in the thigh was obviously diminishing in force and extent. On the 22d of July I examined the limb with great attention, with a view to this point:—the purring was then not perceptible for more than an inch on either side of the sheath of the vessels, neither could it be *seen*, as before; but

required for its discovery that the hand should be applied to the surface. The superficial veins of the leg had become remarkably enlarged.

I may be permitted here to anticipate the subsequent details of the case, so far as to say that these changes were sufficiently explained on dissection by the obliteration which was found to have been brought about in the vein, probably by the long continued pressure, and which, by diminishing the bulk of the circulating contents of the vessel, rendered that remarkable *bruissement* less obvious than before. The obliteration of the femoral vein also accounted for the enlargement of the superficial veins.

At this time the tumour in the ham was little, if at all, increased in size; but on the evening of the 9th of September, the patient applied to be re-admitted into the infirmary, on account of its great and sudden enlargement, which he described to have taken place a few days before, and to have been preceded by much pain and throbbing.

At my visit to the infirmary on the following morning, I found the tumour in the ham increased to three or four times its former size, but still retaining its original form. The skin covering the tumour was extremely tense, and presented, at its most prominent part, a livid discoloration, which seemed to threaten almost immediate sloughing. Great pain was felt in the tumour and all down the leg, and the superficial veins were much enlarged and distended with blood. It was now evident that the patient's life would be very shortly lost by hæmorrhage, unless something were

done without delay for his relief; and though the probable existence of disease in the whole artery rendered the prospect of relief, from any operation, very questionable, it was obviously incumbent upon me to give the patient the advantage of the slender chance presented by the ligature of the vessel. The operation was accordingly performed on the following day, in the usual situation, at the inner margin of the sartorius muscle. Upon dividing the integuments and sheath of the vessels, the artery was found to be enlarged nearly to the size of the abdominal aorta, and its coats so remarkably thin, that it presented more of the appearance of a vein, than of an artery. Much difficulty being experienced in carrying the point of the needle round the artery, apparently from adhesion at its back part, and its extreme tenuity rendering it very hazardous to employ any degree of force, it was deemed advisable to enlarge the opening in the sheath, and pass the ligature about half an inch higher up, which was effected without any difficulty. So attenuated and fragile were the coats of the vessel, that they actually gave way under the slight pressure made by the fingers of a gentleman, who held it with the view of assisting in the passage of the needle under it, and blood issued in a minute jet from its anterior surface. This accident made it necessary to observe the greatest caution in tightening the ligature, as it seemed not improbable that if drawn with ordinary force, it would completely divide the artery. The noose was therefore only drawn to a sufficient degree to stop the pulsation in the sac

and lower portion of the artery, and as the bleeding from the small laceration before described immediately ceased, it was deemed that enough had been accomplished to stop the circulation through the vessel, and the wound having been closed by straps of adhesive plaster, the patient was carried back to bed. The vein was not seen during the operation, being completely concealed by the enormous dilatation of the artery.

It being my object to dwell only on the points of peculiarity presented by this case, I forbear to trespass on the time of the Society by detailing its daily progress, or describing characters which it presented in common with other cases of popliteal aneurism. It will suffice to state that about four hours after the operation feeble pulsation was perceptible in the artery below the ligature;—that on the following day, (Sept. 12th,) it was somewhat stronger, and that the feeling of purring had returned, being, however, limited to the point where the artery was about to enter the sheath of the triceps;—that during the 13th, 14th, and 15th, these phenomena, though somewhat fluctuating, were, upon the whole, increasing in force and extent, and that at the same time feeble pulsation could be *heard*, though not *felt*, in the popliteal tumour. The limb, shortly after the operation was warmer than its fellow, and continued throughout to maintain its superior temperature, and the pain which, prior to the operation, had been felt in the tumour and down the leg, was almost entirely relieved.

In the night of the 15th, hæmorrhage suddenly

took place from the wound to a very large amount, inducing a state of syncope, from which the patient was with difficulty roused. The bleeding was on this occasion restrained by pressure on the wound, but recurred on the following day, when the patient sank exhausted, on the sixth day after the operation.

Dissection.—The lungs were adherent in many parts to the costal pleura and presented several old cavities which were cicatrised. The pericardium was universally adherent to the surface of the heart. The right auricle was large—right ventricle proportionally small—the left ventricle dilated and hypertrophied. The tricuspid and mitral valves were healthy, as well as those of the pulmonary artery and aorta. In the coats of the aorta, at its commencement, at the arch, and near its bifurcation, was deposited much of the atheromatous matter usually found in the large arteries of aneurismal subjects. A single pointed spiculum of bone presented itself among the atheromatous matter at the arch. The aorta was much dilated about the origin of the arteria innominata, which vessel was unusually large. The abdominal aorta was rather thin in its coats.

The external iliac arteries, especially the left, were extremely tortuous, being reflected upon themselves in a singular manner, during their course towards the crural arch: a condition which had, no doubt, given rise to the impression of the artery being extremely dilated, since it conveyed to the hand simultaneously the combined pulsations of the folded portions.

The coats of the femoral artery, throughout its

whole course, were scarcely, if at all, thicker than those of a vein, the attenuation having, as careful dissection afterwards proved, taken place equally in all its coats. Immediately below the origin of the profunda the vessel was greatly dilated, having the appearance of an aneurismal sac. Its coats were here softened and much attenuated, and presented an aperture anteriorly, large enough to admit the point of the ring-finger, from which the fatal hæmorrhage had taken place. The ligature had been placed at a very short distance below this part of the vessel. The wound was full of coagulum, which had also made its way into the sartorius and surrounding muscles, and by its pressure had probably restrained the hæmorrhage so as to prevent the patient from bleeding to death at its first access.

At the spot in the thigh where the communication had been presumed to exist between the artery and vein, there was an aneurismal sac, about as large as half a walnut, firmly ossified within, which, by the pressure it had exerted upon the vein, had caused absorption of its coats, so as to form a circular opening of about two lines in diameter, into which the aneurism had burst,— thus inducing a free and persistent communication between the vessels. Just below the aperture the vein was obliterated at a single *point*, below which it was again pervious. In all the rest of its course up the thigh it was diminished in size and thickened.

The changes above described, which took place in the limb between the time of the patient quitting the

Infirmary and his re-admission, leave no room to doubt that the obliteration of the vein was accomplished in that interval, by the use of the spring, which effectually compressed the vessel under the bony walls of the aneurism.

At the lower part of the popliteal artery, exactly at the point of division into the anterior and posterior tibial trunks, the vessel was dilated into a very large aneurismal sac, which contained a small quantity of laminated fibrine; but the greater part of its contents consisted of loose coagula and serum. The tibia formed a part of the walls of the sac, and was partly absorbed, so as to present a scabrous surface. The posterior tibial artery opened *from* the sac, as the popliteal had opened *into* it, by a circular and even orifice. The anterior tibial could not be examined, as it was sacrificed in separating the tumour from the tibia.

The preparation of the diseased parts is preserved by my friend Mr. Stanley in the Museum of St. Bartholomew's Hospital.

In reflecting upon the circumstances of the above case, we are at first sight inclined to feel less surprise that such a complication of aneurism should *sometimes* occur, than that it should occur so *rarely*. The proximity of the venæ comites to most of the great arterial trunks, naturally points them out as the parts most likely to be involved in the destruction occasioned by the growth of aneurisms; and nothing would seem more easy, than that such a dilatation of an artery should finally burst into the accompanying vein. As far, however, as I have been able to ascer-

tain, no instance has been hitherto recorded of such an accident having taken place in any of those arteries with whose diseases the surgeon is especially concerned—namely, in those of the extremities. Experience shows that pressure on a vein is far more likely to cause obliteration of the vessel, by the effusion of lymph from its internal surface, than either ulceration or sloughing; nor are there wanting numerous incidental proofs of the indisposition of these vessels to partake of morbid changes of the latter kind, in the history of other diseases and accidents. In support of this remark, I may allude to two cases of a different nature, which occurred under my observation, and which tend to show how little obnoxious the veins are to these destructive changes.

The first was that of a woman affected with sloughing phagedæna, in St. Bartholomew's Hospital, in the year 1823, when I held the office of house-surgeon to that charity. After having destroyed the labia, and almost insulated the lower part of the rectum, the disease extended its ravages upwards into the groin, and having laid bare, without opening, the femoral vein, at length destroyed the patient by ulceration of its accompanying artery.

The other instance to which I may briefly advert, was that of a young woman, lately brought into the St. Marylebone Infirmary, in consequence of having been run over by a cabriolet, which had severely lacerated the inner side of the leg. Sloughing ensued of the fascia and muscles, almost down to the bone, and the internal saphæna vein was exposed in full three inches of its length; yet, notwithstanding its almost

entire insulation, it remained unaffected, and was not even obliterated during the granulation and cicatrization of the wound.

The occurrence of so rare a complication in the case just related, is probably due to the circumstance of the aneurism having arisen at a part, where (beyond all other situations in the extremities) the vessels are enclosed in a sheath, so dense and unyielding, as to preclude the possibility of the vein undergoing displacement. Thus, it appears to me, may be satisfactorily reconciled the apparent anomaly of the vein having, in this instance, become obnoxious to the ordinary results of great and long-continued pressure.

I cannot conclude these remarks, without pointing out the confirmation furnished by the case of Jonathan Allum, of the opinion of Mons. Breschet*, that the thinning of the arterial coats, and the dilated state of the vessel *above* the opening of communication, are consequences of the long prevalence of the varicose aneurism. I am not aware of any facts proving the *constant* existence of these changes in arteries predisposed to *true* aneurism, while dissection has almost invariably shown their presence in cases of the *varicose* form of the disease. The concomitant thickening of the coats of the *vein* in the case here narrated strongly corroborates the opinion, that these alterations are in some manner due to the reciprocal interchange of the contents of the vessels, which is proved to take place.

* Op. cit. p. 206.

6, Great James Street, Bedford Row,
Nov. 23, 1835.

CASE

OF

RECOVERY

FROM THE

INSENSIBILITY OF INTOXICATION,

BY THE

PERFORMANCE OF TRACHEOTOMY.

By GEORGE SAMPSON, Esq.,

SURGEON, SALISBURY.

COMMUNICATED BY MR. STANLEY.

READ NOVEMBER 24TH, 1835.

ABRAHAM HARRIS, aged 31, was brought to my house on the 31st of March last, in a state of complete insensibility from intoxication, the pupils being largely dilated, the breathing stertorous, and all voluntary motion having been lost for at least four hours before I saw him. The account given by those who came with him was, that he had attended a convivial meeting in the course of the day, at which he had drunk freely both of beer and brandy; his companions admitted that he had taken more than a pint of the latter, but it has since been ascertained that his glass was repeatedly filled up, without his knowledge, with white brandy instead of water, so that it is impossible to calculate what quantity of spirit he had actually taken.

I immediately used the stomach pump, and drew off between three and four pints of fluid, a great part of which appeared to consist of brandy; after which,

tepid water with ipecacuanha diffused in it was several times injected into the stomach, and after a while withdrawn again, with a view to excite vomiting, and thus rouse the energies of the brain. Finding, however, that these means failed, a strong solution of salt in water, and afterwards the sulphate of zinc, were repeatedly tried, without any better result; but he became, if possible, more comatose, the countenance turgid, breathing more and more difficult; the pulse grew fainter, and was at last scarcely perceptible; at the same time the whole surface of the body was cold and clammy, and he was insensible to every kind of stimulus. As he was some miles from his home, I had him removed to the Infirmary, and called a consultation of the other medical attendants, who arrived in the course of half an hour; but as, in addition to the above symptoms, he had lost the power of swallowing, and every appearance indicated the rapid approach of death, nothing was ordered for him but a turpentine injection, there being no ground to justify a reasonable hope of recovery.

At this period it occurred to me whilst standing by his bedside, that the comatose state in which he lay might not arise from apoplexy, but from torpor of the brain, in consequence of that organ being supplied with blood not duly oxygenated; for the shrill tone and extreme difficulty of respiration shewed the existence of collapse of the glottis, and imperfect transmission of air into the lungs, which might be accounted for by a paralysed state of the eighth pair of nerves and recurrent branches. With this view of the case

I again appealed to my colleagues, and strongly urged that a trial should be given to the operation of tracheotomy; for I could not but hope that if mechanical respiration were carried on for a time, the blood might regain its proper stimulant properties, and restore the energies of the brain and nervous system. Upon their consenting to give him this chance, the operation was performed, without loss of time, by Mr. Andrews, under whose care, as surgeon for the week, the patient was now placed.

The trachea was no sooner opened than the distension of the veins about the head and neck subsided, the violent efforts of the extra-respiratory muscles ceased, and in about half an hour regular and easy respiration through the wound was completely established; at the same time the pupils became slightly sensible to the stimulus of light, and the pulse returned to the wrist. The immediate result of the operation being thus far satisfactory, nothing remained to be done but to give directions for the frequent removal of the mucus which appeared at the wound, and to keep the surfaces of the incision asunder until the integuments and muscular layers had become agglutinated to each other: this latter object was effected by means of a piece of strong spring wire with a bow at each end of it, which, being introduced in a bent state, was allowed to expand, and the opening in the trachea was thus prevented from being covered by the muscles, even during the efforts of deglutition.

He continued perfectly quiet during the night, but had no return of consciousness until the following

morning, when he gave us to understand, by signs, that he suffered from headache and soreness at the pit of the stomach; there was a tendency to sickness, and the tongue was coated with a peculiar whiteness, as if rubbed over with chalk. Moderate purgatives, followed by mild alkaline medicines, soon removed these symptoms, and a few leeches were applied to the throat, for the purpose of checking too high a degree of inflammation; after which no further treatment was required; but the wound being healed in about three weeks, he was discharged cured, and has continued up to this time in the enjoyment of perfect health.

ON

THE TREATMENT

OF

INJURIES

RECEIVED IN DISSECTION

By R. A. STAFFORD, Esq.,

SURGEON TO THE ST. MARYLEBONE INFIRMARY.

READ DEC. 8TH, 1835.

Injuries occasioned by dissection are of so frequent occurrence, and present local and constitutional symptoms of so severe and fatal a character, that any attempt to illustrate their treatment will, I presume, not be unworthy the attention of this Society.

Three opinions have prevailed in the profession regarding the nature of the symptoms resulting from these injuries: one, that a peculiar virus is introduced into the system, which so influences the nervous and vascular functions, as to occasion the alarming symptoms: another, that the latter depend on the nature of the part injured, as in the case of puncture of the sheath of a tendon, &c.; and a third, that impaired general health preceding the accident is the cause of the symptoms.

We may admit constitutional predisposition in all cases: but it appears to me that the pheno-

mena can only be satisfactorily accounted for on the first supposition, that of the introduction of an animal poison. For we find the most alarming and rapidly fatal cases to occur where there has been but a slight abrasion or scratch, as well as where a deeper wound has been inflicted by the point of the scissors, the hook, or the scalpel, so as to render questionable the probability of wounding the sheath of a tendon. Further, many cases are recorded in which no abrasion, scratch, incision, or puncture was noticed, or any evidence of such injury found on the most minute inspection of the part; consequently some deleterious poison must have been absorbed by the skin. I shall produce remarkable instances of this mode of receiving the injury. It is also a curious fact, that in most of the cases recorded by Dr. Duncan, Dr. Colles, Mr. Travers and others, and where the symptoms were the most severe, and the result fatal, the wound was generally no larger than a puncture by a needle, or a slight abrasion.

It would appear that in dissection wounds, the constitutional symptoms and the local affection vary considerably both in intensity and extent. In some individuals the wound itself only inflames; in some the absorbents also become inflamed; and in others an abscess may form in the axilla without further mischief. These are the simple cases; but there are others of a more formidable character,—cases where, in a few hours, without the local injury being of any extent or severity, indeed hardly per-

ceptible, the constitutional symptoms are of so appalling a nature, that the vital powers are at once overwhelmed, and almost immediate death is threatened. In other cases, again, diffuse cellular inflammation occurs in the hand, the arm, the axilla, the side, or some other part of the body, giving rise to vast collections of pus and sloughing of the cellular tegument, and thus overpowering the constitution. Absorption of animal matter may also be attended by the appearance of vesicles containing fluid on various parts of the body. Such cases are related by Dr. Duncan*, Dr. Colles†, and others. It may produce also mortification of the injured part, as in Dr. Pett's case‡; irritative fever, eruptions, diarrhœa and general ill health.

Such then being the various forms in which they affect different individuals, there consequently has been considerable variety, and indeed contrariety, both in the local and constitutional treatment of injuries of this description; and the principal object I have in view in the following pages, is to relate several severe cases which have fallen under my observation, and which I believe tend to illustrate the treatment of the injured part, as well as the formidable and appalling constitutional symptoms which too frequently supervene.

* Medico-Chirurgical Transactions of Edinburgh, Vol. I.

† Dublin Hospital Reports, Vol. III.

‡ Travers on Constitutional Irritation.

CASE I.

On Sunday, 2d of March, 1833, at eight o'clock in the morning, I received a note from my friend Dr. Sims, informing me that the absorbents of his right fore-finger and fore-arm were inflamed, in consequence, as he supposed, of his having dissected a brain on the previous day. I immediately went to his house, and we both very minutely examined the finger. There was an elevated spot on the inner surface of the second phalanx resembling the bite of a gnat, but we could not discover in any part of it, not even by a magnifying glass, the slightest trace of a puncture. The finger was extremely painful, and considerably swollen and inflamed. The inflammation of the absorbents extended in two or three distinct lines along the inner side of the fore-arm nearly up to the ulnar side of the elbow joint. On the night before, Dr. S. went to bed in his usual health. At four o'clock in the morning he was awoke by the pain in his finger, at which time he got up, and took a five grain dose of calomel. The pain and inflammation gradually got worse, and at eight o'clock the hand and fore-arm were in the state I have already described. The pulse was hard and at ninety, having that thrilling or jerking stroke which indicates constitutional disturbance; the tongue was coated by a dirty white fur, and the skin was somewhat hotter than natural. Eight leeches were applied to the finger; an evaporating lotion on the fore-arm, and a

senna draught taken. From the rapid progress of inflammation of the absorbents, the case put on an increasingly unfavourable aspect. Between twelve and one Dr. Lee called upon him; he was then much worse. The pain in the finger had greatly increased, and the inflammation of the absorbents had extended nearly to the axilla. The pulse was small and irregular, wavering from 120 to 130. There was a peculiar physically anxious expression of the countenance, accompanied with a nervous tremor over the whole frame; the voice was tremulous, and occasionally there was a transient incoherency, which, however, Dr. S. appeared conscious of, and could immediately command. In addition to these symptoms, he suffered a most excruciating pain in the lumbar region, which caused a constant involuntary tremor and twitching of the lower limbs, and more particularly on the right side. In fact, the whole nervous system appeared to have received so great a shock, that the symptoms almost resembled those produced by the bite of a venomous reptile.

As the symptoms were rapidly increasing in severity, we felt it our duty to call in the most able and experienced members of the profession. In the mean time, however, the nitrate of silver was rubbed on the surface of the arm along the course of the absorbents, about three inches in breadth and two in length, with a view of arresting the progress of inflammation. Sir Astley Cooper and Mr. Lawrence were sent for. We met Mr. L. between two and three o'clock in the afternoon, Sir Astley being

out of town. The symptoms were advanced in severity. There was a depression of the nervous system, as if a fatal change might soon take place. The tremors continued; the pulse was extremely small, faltering and irregular. There was a cold clammy perspiration on the skin. The pain and inflammation of the finger and fore-arm had greatly increased, and the pain in the back was almost insupportable, attended in a much greater degree with the convulsive twitchings of the lower limbs. In our consultation, the indications appeared to be, to lessen and oppose the further progress of inflammation, and to tranquillize the nervous system by the application of leeches, the employment of fomentations, keeping the patient under the influence of opium as long as the pain continued, and administering aperients until the bowels were freely relieved.

Twenty more leeches were immediately applied to the finger, and along the course of the inflamed absorbents; the hand and arm were afterwards well fomented. Twelve grains of the compound powder of ipecacuanha were taken, but immediately rejected. A fourth of a grain of the muriate of morphia in solution was therefore substituted.

8 o'clock, P.M. The bowels had acted three times without the repetition of the aperient. The muriate of morphia had produced some relief. The pain in the finger and back were somewhat lessened. The tremors and muscular twitchings were much the same. The finger still more swollen and tense, and

the palm of the hand and third phalanx swollen. Inflammation of the absorbents not reduced.

A deep longitudinal incision was made along the flexor tendon of the second phalanx, but no pus escaped. To continue the fomentation, and apply twenty more leeches to the hand and absorbents. Repeat the muriate of morphia as often as occasion may require.

March 3d, 4 o'clock, A.M. After the leeches had been applied and the morphia taken in the evening, Dr. S. dosed for an hour or two. When the muriate of morphia had been taken half an hour, all the symptoms abated. The pulse was reduced from 130 to 100, and beat with a firmer stroke. The tremors were lessened and the pain in the back and hand considerably diminished. The effect of the morphia had now ceased; the pain in the hand and particularly the finger was excessive. The pulse had increased to 140, and wavered irregularly. The tremors and twitchings of the limbs were still more violent than they had been, and the pain in the back excruciating. The depression of the nervous system was even greater than it ever had been; so much so that unless relief could be obtained, a speedy dissolution might have been expected. Half a grain of the muriate of morphia was immediately given. The effect was remarkable. In five minutes it began to act. The pain gradually diminished; the tremors and twitching of the limbs were alleviated. The frequency and unsteadiness of the pulse (being only between 90 and 100) diminished, and the patient fell

asleep. In two hours, however, all the symptoms began to return. The same dose of muriate of morphia was administered with the same good effect, and ordered to be repeated every second hour as long as the symptoms demanded it.

8 o'clock, A.M. The hand in much less pain; the swelling had increased on the third phalanx and palm of the hand. The inflammation of the absorbents remained nearly the same; if any thing, slightly abated; and the tremor and pain in the back continued, but were alleviated. The pulse from 100 to 110, slightly irregular and faltering; tongue coated with a brown fur.

Twenty leeches to be applied to the absorbents and most painful part of the hand; to continue the morphia, the fomentations, and poultice. He was allowed fever diet, but he could take nothing but soda and seltzer water, and an occasional cup of tea. Sir Astley Cooper met us in consultation to-day.

8 o'clock, P.M. During the day all the symptoms were alleviated. The tremors were lessened; the pain in the back was not so violent; the pulse was more equal, averaging 100; and the inflammation of the absorbents was somewhat diminished, but the hand, as to pain, remained the same. The swelling of the third phalanx, however, was greater and more tense, but no pus had apparently formed. Ordered twenty leeches to the hand and absorbents; to continue the fomentation and poultice, and still to be kept under the influence of the morphia.

March 4th, 8, A.M. Had passed a better night,

having slept two hours. The tremors and pain in the back much better. The third phalanx of the finger more swollen and tense, but the absorbents less inflamed. Signs of the formation of matter were not evident. Pulse 98; skin moist; tongue covered by a dirty white fur. Bowels had not acted. Ordered a mild aperient, and to continue the other treatment.

3 o'clock, P.M. Finger more painful, tense, and swollen; slight fluctuation on the third phalanx could be felt. A deep longitudinal incision was made into it, and pus made its escape with the blood. To foment, poultice, &c., as before.

8, P.M. Finger much relieved and the other symptoms diminished.

March 5th, 8, A.M. Slept at different times during the night. Better in all respects. An opening made into the swelling on the palm of the hand, and pus evacuated. To go on with the treatment.

In a day or two the several wounds in the finger were laid open together, so as to make one continuous incision from the point of the finger into the palm of the hand; this gave great relief by removing the excessive tension of the parts. Several other collections of matter formed in different parts of the palm, and were opened as soon as discovered.

From this time the constitutional symptoms gradually abated. The inflammation of the absorbents subsided, and the openings made into the finger and hand discharged pus freely. Poultices were constantly applied and the hand frequently fomented.

The morphia was gradually diminished in quantity. His diet was improved, and tonics administered. Dr. S. was at length able to go into the country, and after an illness of six weeks he was restored to his usual health. In defiance of all treatment the flexor tendons sloughed, and consequently, when the wounds were healed, the finger remained motionless and stiff.

The first circumstance which may be observed in this case is, that no wound took place, nor was there any abrasion of the cuticle. All that could be perceived was an elevated white spot like a gnat bite, but at no point of it could it be discovered, not even by a magnifying glass, that a puncture had been made. It would appear then, that absorption by the skin had taken place. The possibility of such an occurrence may perhaps be doubted, but there are incontrovertible proofs that it can happen, independently of this instance. In the case of Mr. Pierce, which I shall presently relate, no puncture could be found, and Dr. Duncan, in a paper of his on "Diffuse cellular Inflammation," in the Transactions of the Medico-Chirurgical Society of Edinburgh, mentions a similar instance, where Mr. Cumming, a medical practitioner, was present at the dissection of a young woman who died from puerperal fever. "He took no share in the dissection, excepting introducing a fresh thread into the needle which was employed in sewing the body, and was not aware of an *abrasion*, or of *having punctured himself in the act of threading*. About eight hours after he felt an un-

easy sensation in the middle finger of the left hand, at the inner side of the first flexure of the joint, where, on examination, there was discovered an angry pimple." Absorption took place, in consequence of which the patient died on the eleventh day.

In the case before us, the rapid progress the inflammation of the finger and absorbents made, is very striking. At four o'clock in the morning Dr. Sims first felt pain in the finger; at eight o'clock it had swelled to nearly double its usual size, and the absorbents on the fore-arm were inflamed; and at twelve the inflammation had extended to within two inches of the axilla. The frequent depletion necessary to be employed was attended by the most beneficial result. The severity of the inflammation was such that there is but little doubt in my mind, that had not a large number of leeches been repeatedly applied to the hand and arm, the glands in the axilla would have become inflamed, and abscess most probably have ensued.

The tremors, the tetanic convulsions, and the general shock to the nervous system occurring so soon after the signs of injury manifested themselves, would lead us to infer that the poison was received very quickly into the blood, and produced an almost immediate impression on the brain. As there was no apparent lesion of the finger, no other mode of explanation offers itself to my mind, excepting such an effect being produced through the agency of the circulation, and secondarily affecting the nervous system. This is not a solitary instance of the sym-

ptoms showing themselves so quickly after the puncture. In Moss's and Mr. Pierce's cases the same took place, and in most of those related by Dr. Duncan and others, the absorption was equally rapid. In other local injuries, even where the absorbents are inflamed, such symptoms do not occur. Hence, the irritation of what are termed a hangnail, and whitlow, or an irritable sore, which sometimes has this effect, is not attended by such constitutional consequences.

The powerful effect of the muriate of morphia in allaying the violence of the nervous symptoms, is remarkable. So soon did its action commence, that in five minutes after its exhibition its beneficial influence could be perceived. The frequency of the pulse gradually subsided, the tremors abated, and the pain in the back and hand were suspended. The equability of the action of the muriate of morphia is still more remarkable. As soon as a dose of it was taken, its influence was felt. The patient almost instantly dosed, and then slept. This state continued for a uniform period, (from two to three hours,) and unless the medicine was repeated all the symptoms returned.

Whether the application of the argentum nitratum on the surface of the skin above the inflamed absorbents had any effect in arresting the progress of inflammation, cannot for a certainty be ascertained. It is probable that it had, for in two other cases where I have used it in a similar manner, no abscess

in the axilla formed, and the glands did not become enlarged.

This case illustrates one important point, the necessity of making an opening as early as possible into a swelling where matter is suspected to be formed. Before the openings were made, the pain was excessive, and the irritative fever was kept up by the confinement of the pus and tension of the part. As soon, however, as the matter, although in so small a quantity, was let out, the pain was relieved, and the symptoms gradually abated. It was extremely difficult for some time to ascertain whether pus was formed or not in the third phalanx, and in the different points of the palm of the hand. Sir Astley Cooper and Mr. Lawrence were both a considerable time before they could satisfy themselves on the question. At length, however, an indistinct fluctuation could be felt; an incision was made into the part, and a small quantity of pus, deep seated, escaped with the blood.

Seeing the extreme difficulty of ascertaining whether pus is formed or not, in all cases of severe injury of this description, I would recommend that an opening should be made into the suspected part where there is considerable tension, with much irritative fever, accompanied with a depressed state of the nervous and vascular system. In the first place, should the swelling contain matter, instantaneous relief would be given by its being let out; secondly, should such not be the case, the extreme tension of the part

will be relieved, and also the distress occasioned by it; and lastly, the blood-vessels of the part will be unloaded.

The next case which I shall relate, appears to me to illustrate in a remarkable manner the necessity and propriety of making early openings in swellings arising from this cause.

CASE II.

In Dec. 1831, Mr. Pierce, the late assistant apothecary of the St. Marylebone Infirmary, opened the body of a woman who died from puerperal fever. He was not aware at the time that he had wounded himself, nor was there any previous wound on the hand. When he rose on the following morning, he found himself very unwell, being languid and feverish, with pain in his head. In the evening of the same day, he complained of soreness and pain in the axilla, but he did not suspect, as there was no puncture perceptible nor inflammation of the absorbents, that his symptoms proceeded from absorption of animal virus. Leeches were applied to the axilla, and the bowels freely opened. Fomentations and poultices were employed, and fever medicine prescribed. The swelling increased and spread generally to the glands and cellular membrane surrounding them. Leeches were again applied, and the antiphlogistic treatment strictly adhered to, but from day to day the swelling increased. On the fourth day there appeared a general enlargement of the same side, extending from the third rib to about

three inches above the ilium. The part gradually became more tense, and there was a deep reddish blue appearance on the surface. No fluctuation could be discovered, and no prominence at any particular part of the enlargement. The constitutional symptoms now put on a very alarming character; the pulse was 140 and fluttering, there was extreme nervous depression, anxiety and distress of countenance, dry tongue, restlessness, low delirium, and dyspnœa.

At a consultation of several physicians and surgeons, it was concluded to delay opening the swelling, as there was not complete evidence of the presence of pus. The poultices were ordered to be continued, and wine and other remedies given to allay pain and support the system. During the night all the symptoms became worse, the pulse weaker, and it was evident the patient was fast sinking. In the morning, as the only remaining chance of saving life was to open the swelling on the side, Mr. Mayo made an incision nearly an inch deep and four in length into it. No pus escaped, but it bled very freely. From that moment, however, Mr. P. was relieved, and all the symptoms abated. In two days, a profuse discharge of matter made its way out from the bottom of the wound, and its quantity was so excessive that he became greatly reduced and exhausted. He was consequently allowed wine in considerable quantity, bark, meat, porter, strong beef-tea, and gravy, and, in short, nourishment of every description that the stomach could bear, and such as circumstances required.

The abscess in the side communicated with that of the axilla, beneath the pectoral muscles. The discharge continued gradually diminishing in quantity however, for nearly two months, during which time the treatment which I have just mentioned was employed, and at the end of three months Mr. P. recovered.

In this case the patient was reduced to the lowest state of exhaustion and distress, threatening dissolution, in consequence of the tension of the swelling of the side. Although no pus escaped at the time the opening was made, yet the tension of the part being relieved he immediately revived, and the nervous system in some measure recovered its vigour. It is highly probable, that had not this operation been performed at the time it was, he would have sunk. There are some other points of interest in this case. The absorbents were not inflamed, neither could any trace of a puncture be discovered. So little conscious was Mr. P. of having wounded himself, that he had not the least idea of the cause of his sufferings until some time afterwards, when he was told the reason. On being questioned, he then fancied he recollected that he had pricked one of his fingers, but which he could not say, while sewing up the body. Supposing he had punctured himself, there does not appear to have been inflammation of the absorbents, or of any part where a wound was received.

The following case is a good illustration of the advantages of the application of the argentum nitratum.

CASE III.

Joseph Moss, æt. 51, punctured the second phalanx of the forefinger on June 16th, 1835, while sewing up a body. On the same day, a few hours afterwards, extreme lassitude came on, with violent pain in the head, in the loins, the knees, and limbs, accompanied with rigor. The finger became extremely painful and swollen, which deprived him of sleep; on the following morning he was admitted into the Infirmary under my care. The finger was then extremely swollen and tense on each of the phalanges, but there was no fluctuation. The absorbents were inflamed in three distinct lines up to the elbow, with a general mottled red appearance between each. The constitutional symptoms were the same as yesterday. The fever was very high, and he felt great lassitude. Pulse 110; tongue covered with a white fur; extreme thirst.

Ten o'clock, A.M. Twelve leeches were applied immediately to the finger, a calomel pill and an active purgative were taken. The fomentation of the decoction of poppies was applied.

Two, P.M. Pulse 104, symptoms the same, if any thing rather lessened. The nitrate of silver was applied about four inches above the elbow, on the course and immediately above the inflamed absorbents, about two inches in breadth; twenty more leeches were applied to the finger, and along the inflamed absorbents; ordered to take an antimonial mixture every six hours, and to continue the fomentation.

Eleven, P.M. Bowels had acted several times: less pain in the finger and along the arm; febrile symptoms the same. Ordered ten more leeches along the absorbents, a poultice to the finger; to take half a grain of the muriate of morphine every six hours, and continue the antimonial mixture.

18th, 2 P.M. Has had a better night, sleeping an hour at a time. Pain much less; absorbents less inflamed; no enlargement of the glands; finger less painful and less tense. Pulse 74, fever subsiding; tongue less furred. Bowels had been opened once; continue the morphia and antimonial. To go on with poultice and fomentation, and apply four leeches to the third phalanx.

19th. The finger less painful and reduced in size. A puncture was made into the first phalanx, and a serous fluid let out; absorbents much less inflamed. Pulse 94, tongue cleaner, but there was a dryness in the throat. Had a bad night; bowels had only acted once and slightly. Ordered a senna draught, a spirit lotion to the arm, and poultice to the finger; to continue the medicine.

20th. Much better in all respects; bowels had acted several times; had a good night. The inflammation of the absorbents disappeared, and the finger much less swelled.

From this time all the symptoms abated, and the finger healed in a few days, without leaving stiffness, or any injury behind. He had however an attack of rheumatism afterwards in the joints, which he had

been occasionally subject to for years, and which yielded to the usual treatment.

It may be observed this case in some measure resembles that of Dr. Sims. The symptoms were by no means so severe, but in many points they approach each other, and the treatment also in each appeared to be equally beneficial. It appears also that in both cases there was no extension of inflammation of the absorbents, beyond the part where the argentum nitratum was applied.

CASE IV.

April 27, 1832. Thomas Brown, æt. 69, whose occupation was that of an attendant in a dissecting-room, punctured the forefinger of the left hand. In the evening the part became extremely painful and swollen, and he immediately applied for advice. Leeches were applied to the inflamed part, with fomentations and poultices. He also was ordered a dose of calomel, and a brisk aperient.

On the next morning the inflammation had extended along the absorbents in dusky red lines, up to the ulnar side of the elbow. The nitrate of silver was immediately applied above the inflamed part, on the skin, two or three inches in breadth. Leeches were again applied to the absorbents and finger, and repeated as often as required. The inflammation did not extend beyond the application of the caustic, which appeared to arrest its progress. Under this treatment the patient recovered in a few days.

CASE V.

In March 1835, Brown received another wound, and came under my care. States that in sewing up a body, he pricked his left thumb. He took no notice of it at the time, and even although he suffered great pain in it, accompanied with inflammation of the absorbents, rigor, headache and fever, &c., he did not apply for advice until four days afterwards.

March 31st. The absorbents of the left upper extremity were considerably inflamed, and the glands in the axilla enlarged, being about the size of a pigeon's egg. They were extremely tender, but no pus had formed, and the absorbents were of a deep dusky red colour. The constitutional symptoms at this time were, high fever, quick pulse, dry tongue, pain in the head, and delirium. Leeches were repeatedly applied to the absorbents and axilla, and fomentations and poultices were employed. An active aperient was administered, and antimonials, and the muriate of morphia, were prescribed. On the following day he was seized with excessive dyspnœa. Coma soon came on, and he sank.

This case points out the urgent necessity of early attention to an injury of this description. Three years before, this man suffered from the same affection, and by immediate treatment was restored. On this occasion, however, the inflammation had made

rapid and fatal progress before proper remedies could be employed.

On dissection, extensive pneumonia was found, which appeared to be the cause of death. Several of the axillary glands were inflamed and enlarged, and others had suppurated. The brain was congested with blood, a bony tumor was attached to the base of the mitral valve of the heart, and the liver was diseased.

CASE VI.

At the latter end of August, 1835, Dr. R. Lee having a slight abrasion on the inner side of the left forefinger, was examining a uterus that had been macerating a day or two in water. About twenty-four hours afterwards he felt some uneasiness about the second joint, with slight swelling. For several days this uneasiness continued, and pain was occasioned by bending the joint. A week after the accident the pain increased, with shooting pain along the arm. The constitution now became affected, and he complained of great debility, chilliness, and general irritation of the system. The pain rapidly increased in the finger, with swelling, redness, throbbing, and a sense of stricture around it. Leeches were repeatedly applied to the finger and palm of the hand, during the next three or four days, with warm fomentations and poultices. These remedies produced very great relief, but the part gave the sensation of matter being deeply seated. Mr. Copeland saw the finger,

and recommended the application of a splint, cold lotion, and absolute rest of the part. The finger has been gradually recovering up to this time; there is still some swelling, and slight pain on motion.

Of the Treatment.

When signs of absorption have taken place, which will be known by the pain and inflammation of the wound, and whether the absorbents are inflamed or not, it would be advisable to rub the argentum nitratum on the cuticle, across the course of the absorbents, about two inches in breadth, and sufficient to blacken the surface. If the absorbents are not inflamed, its application should take place on the forearm, as near as possible to the hand; but if they are already inflamed, it should be employed immediately above the point to which the inflammation has extended. The next step will be, to evacuate freely the contents of the bowels. The part around the wound will now probably begin to swell. It must be immediately reduced by leeches, and their application must be repeated at each accession of inflammation, or non-reduction of it. Soothing fomentations also must be employed, and poultices, &c., to the wound. Attention to the constitutional symptoms will now be of the utmost importance. If there be, according to the severity of the case, extreme pain in the wound, violent pain in the head, the back, in the lumbar region, rigor, tremor, tetanic convulsions, and extreme nervous depression,—these symptoms should be immediately combated as soon as they arise; and from the results of

the treatment adopted in Dr. Sims's and Moss's cases, under such circumstances, the muriate of morphia appears to allay them more than any other remedy. In these cases, and particularly in Dr. S.'s, the effect of this medicine was remarkable. Although he was suffering the most excruciating agony in the back and finger, with all the symptoms above mentioned, yet this remedy had an immediate effect in producing composure, and keeping down their violence. It appears advisable, therefore, to administer it in such doses, and with such frequency, as to keep the patient under the influence of its action.

After the first shock the system has received from the introduction of the poison, fever will supervene. This symptom will be, perhaps, best treated by sudorifics, and the usual means employed under such circumstances. A question may now arise, whether general bleeding should be employed or not? There may be individual cases, where the patient is of so plethoric a habit, or so inflammatory a tendency, that the abstraction of blood may be required; but, generally speaking, it appears to me that it would be better to avoid it. My reason for thinking so is, that in the first place the nervous system has already been depressed by the introduction of the poison—in the second, the fever which is present cannot be considered simply of an inflammatory nature, but rather of an irritative kind,—and in the third, that although the present symptoms may be violent, yet perhaps from the formation of abscesses, and the general reduction of the patient, he will afterwards

require as much of the restorative power as possible to recover his strength. On referring to the cases published by Dr. Duncan in the Medico-Chirurgical Transactions of Edinburgh, it will be seen that several of the patients suffering from injuries from dissection were bled. In many of these cases the patients died; they never appeared to rally after the bleeding.

The second stage of the treatment embraces the keeping down the inflammation of the absorbents, the prevention of inflammation of the glands in the axilla, and the treatment to be pursued when pus is suspected to have formed in any part.

Although it appears to me that general bloodletting is not advisable in most cases of injuries from absorption, (excepting under peculiar circumstances,) yet on the other hand I consider topical bleeding of the greatest consequence; indeed so important does it appear, that I feel persuaded that without its employment, when the inflammation of the hand and absorbents is very great, the patient has but little chance of recovery. Blood therefore should be abstracted by the repetition of leeches on the inflamed part, on any swelling arising from the wounds, along the course of the inflamed absorbents, and on the glands of the axilla, or any other part where their employment may be required. The good effects of topical bleeding will be seen in Dr. Sims's, Moss's, Brown's and Dr. Lee's cases. In all these it was employed, and in not one of them was there formation of pus in the axilla or the side. The ad-

vantage of it in Dr. S.'s case is perhaps more marked than in any of the others. Here they were applied by twenty at a time, and so frequently, that not more than four or five hours elapsed between each application. The relief they gave was indescribable. We will suppose, however, that they had not been employed,—the consequences appear pretty evident,—abscesses might have formed in the axilla, the side, or along the course of the absorbents, unless, as is most probable, death had previously taken place.

It not unfrequently happens, that in defiance of all our endeavours to prevent it, pus will be formed in the axilla, the side, or some other part. It now becomes a question of great importance in what manner a swelling, where such formation is suspected, ought to be treated? At first it will perhaps be extremely difficult to ascertain whether matter is formed or not, and at the same time the patient may be suffering from the tension of the part the most distressing symptoms. There may be great pain,—depression, fluttering pulse,—delirium,—exhaustion, and general distress. Under these circumstances, whether pus is formed or not, the swelling ought to be opened; and as the chief object, if matter be not formed, is to relieve the tension of the part, the incision made should be of considerable length. It was upon this principle that Mr. Lawrence recommended free incisions in erysipelas, in his excellent and practical paper published on this subject in the Transactions of this Society.

The case of Mr. Pierce, is perhaps, as good an ex-

ample as can be produced to prove the efficacy of making an early opening into a swelling, where pus is suspected to have formed. Here the most alarming symptoms occurred, and even death was threatened from the distress the tension occasioned; as soon, however, as an incision was made into it, relief was obtained. Dr. Sims's case also is another example of the same: but, in addition to these, there are others mentioned by Dr. Duncan*, Dr. Colles†, and Mr. Travers‡, in which more benefit was derived from this plan of treatment than any other. Mr. Blyth had a swelling in the side, and suffered the most severe pain and distress from it. It was opened and he was relieved. Mr. Whitelaw was in the same situation; an abscess was opened in the axilla, and from that time he recovered. The same occurred in the case of Mr. W., communicated to Dr. Duncan by Dr. Molleson. A deep incision was made into the finger and another afterwards in the axilla from which pus escaped. Mr. A. B., also, was relieved immediately on an opening being made into the tumor, and a large quantity of pus let out. Before, the constitutional irritation was so great that the pulse ranged from 130 to 160. In two cases which Dr. Colles relates in the Dublin Hospital Reports, the same good effect resulted from this treatment. In the case of Mr. Hutchinson, an incision was made into an erysipelatous redness of large extent of

* Medico-Chirurgical Transactions of Edinburgh, Vol. I.

† Op. Cit. ‡ Op. Cit.

a doughy feel on the side. Although no pus was let out, yet the operation gave immediate relief. In the second, that of Mr. Egan, the result, when the pus was allowed to escape, was favourable, whilst his coadjutor, Professor Dease, where the abscess was not opened, died.

It is a remarkable fact, but in most of the cases related by Dr. Duncan, Dr. Colles, and others,—where a swelling or abscess took place without an opening having been made into it, the patients did not recover. The first case was that of Mr. Young. He died from pleuritis, but on dissection an abscess of vast extent, reaching from the axilla to the ilium, was discovered, containing purulent matter; and it would appear, from its contiguity with the pleura costalis, that it caused inflammation of that membrane, which spread to the pleura pulmonalis. The next cases are those of Mr. Hersey, Dr. Dewar, and Mr. Cumming. In these no openings were made into the swellings arising from the absorption, and each ended fatally. The case also of Professor Dease is an example of the same description. In all of these cases an abscess had formed, or there was swelling with tension in the arm, the axilla, or the side. No openings were made. On the contrary, in those cases where openings were made, the patients lived. The experience of Mr. Travers also confirms the necessity of the foregoing treatment. In those cases related by him where the tumefaction was treated by early incision the patients mostly recovered, whilst on

the contrary, where this practice was not pursued, the disease generally proved fatal*.

The following inference, therefore, may fairly be drawn:—that free incisions made into swellings arising from the absorption of animal poison are attended by the most beneficial results, and that, from the facts now brought forward, they ought to be made in the earliest stage of their formation.

The third stage of the treatment, when abscesses are discharging profusely, and the patient is reduced by the violence of the disease, consists in giving power and support to the constitution. Bark, wine, meat, porter, and nourishing diet of every description that the stomach can bear, and such as circumstances require, may be allowed. The abscesses and other symptoms may be treated according to the common principles of surgery.

During the progress of the disease symptoms may arise, such as inflammation of the lungs, &c., which I have not mentioned in this paper. These can only be judged of by the attendant at the time, and should be treated accordingly.

* Travers on Constitutional Irritation.

ACCOUNT OF A CASE

OF

FRACTURE AND DISPLACEMENT

OF

THE ATLAS.

By BENJAMIN PHILLIPS, Esq. F.R.S.

Communicated by Sir BENJAMIN C. BRODIE, Bart.

READ FEBRUARY 9TH, 1836.

In the summer of 1827, during the hay-making season, William Cross, an agricultural labourer, was standing upon a hay-rick, for the purpose of receiving the hay which was brought from the fields, While he was thus occupied he slipped off the rick, and fell to the ground head foremost, the occiput coming in contact with the soil. By the fall, he was "stunned," but the stunning effect, or concussion, thus produced, was soon sufficiently dissipated to allow of his walking a distance of half a mile, to the residence of the parish surgeon, by whom he was bled and purged.

On the following day he felt scarcely any inconvenience from the accident, and in two days more he proceeded about his usual business.

From the day succeeding the accident he felt what

he termed, and what really was, a " stiff neck," for he was unable to rotate the head. This " stiffness " was all he complained of when I first saw him, which was between three weeks and a month from the occurrence of the accident, and on that day he had walked above two miles.

He was a powerful, scrofulous looking man of thirty-two, but he said that his health had been, usually, good. I examined the back of his neck which was, he stated, the seat of the only uneasiness, and that inconsiderable, which he experienced. Immediately over the second cervical vertebra, a small tumour was apparent; pressure upon it occasioned only a very little pain.

All the functions of the economy, with the exception of the inability to rotate the head, were well performed, and I was not able to detect any other lesion of motion or sensation. The idea which occurred to me was, that a chronic inflammation of a scrofulous character was developed in the first or second cervical vertebra, or perhaps in both, and that the articulating surfaces between them had been so modified as to threaten what is termed " false " anchylosis.

He stated that up to the receipt of the injury I have described, rotation of the head had been in no wise impeded; the presumption therefore appeared to be, that the morbid action had been excited by the accident. In consonance with this diagnosis it was determined that he should lie upon a mattress without a pillow, and that twelve leeches should be applied

upon the affected region every third day. The leeches were applied six times, but the only benefit which was derived from their use was to remove, to a great extent, but not entirely, the tenderness.

At the end of ten days from the last application of leeches, an issue was made over the same point; this continued to discharge for two months, at the expiration of which it was determined that it should be dried up; the symptom which has been described remaining, as nearly as may be, unchanged.

The surface being cicatrised, the tenderness having almost completely yielded, but the tumour still retaining its original character, it was determined to try the effect of another issue, which was accordingly made. The second caustic was applied in the fifth week from the period when the cicatrisation of the preceding one was decided on; and up to that time, no other benefit was experienced from the treatment which had been employed, than the removal of the tenderness, which was not now felt even upon pressure.

Soon after this I noticed, what may have existed for some time before, a *thickness* of the voice, such as is produced by enlarged tonsils. I looked into the throat, and discovered that the tonsils were very large, but they did not afford any decided indication of recent disease. In a few days after I had discovered the change in the character of the voice, he complained of a little inconvenience in swallowing. I then carefully examined the throat, and discovered a slight projection or fulness at the back of the pharynx, as near as may

be at the level of the body of the second cervical vertebra. It appeared to me that this circumstance was perfectly reconcilable with my diagnosis, and I concluded that an enlargement of the body of the axis had been produced, and that the interference with phonation and deglutition was so caused.

The second issue had been discharging for about five weeks, when he became the subject of a severe attack of pleuritis, for which he was copiously bled; by this attack, from which he recovered, he was a good deal debilitated, and during its progress the issue was healed. At the time the pleuritis had subsided, and the issue had been healed, nearly thirty-three weeks had elapsed from the occurrence of the injury.

Soon after this time, say at the end of nine months from the accident, symptoms of anasarca were manifested, and the infiltration shortly became general, but it more particularly affected the lower extremities, the scrotum, and the prepuce; the integuments covering these several organs being tense and glistening. To relieve this state, he took drastic purgatives, digitalis, and supertartrate of potash; great relief was also afforded by acupunctation, applied to the organs I have named.

From the anasarcous affection he continued to suffer more or less, until the forty-seventh week from the injury, when effusion into the cavity of the thorax took place, and he died from hydrothorax. Up to the last week of his life, he was accustomed to walk to the water-closet, which was on the same floor with

his bed, and was never assisted in taking food, even though lying on his back; and no evidence was ever afforded to those around him, that motion or sensation, with the exception I have already named, was in the slightest degree impaired, neither had the difficulty of swallowing materially increased.

Many obstacles were placed in the way of a post mortem inspection of the body, by his friends, who felt much repugnance at the idea of his being made the subject of such an examination; and as the case did not, to my mind, present any feature of very peculiar interest, I had almost determined to urge the matter no further; I however obtained permission to examine the back of the neck, when I found the appearances which will be illustrated by the accompanying preparation.

The condyles of the occiput still rested upon the articulating surfaces of the atlas, but the atlas was found to be, not a separate and independent vertebra, but an appendix to the axis. So much of its anterior portion, as includes the surfaces by which it is articulated with the occiput and with the axis, had been violently separated from the posterior portion of its ring, and had been carried in an oblique direction, downwards and forwards, until it arrived upon the same plane, but anterior to the axis, to the body and transverse processes of which it became attached by perfect bony union, whilst the posterior fragment had suffered no displacement.

Under these circumstances, the bone presented two spinal foramina, and four transverse, but no odontoid

process. This organ having been fractured and separated no organ passed through the anterior spinal foramen.

For the purpose of discovering any thing like a parallel to this case, I have referred to all those works mentioned by Ploucquet and Reuss to which I could obtain access, as well as to the later works of Sir A. Cooper, Scarpa, Sœmmering, Boyer, and Richter, but without success.

There are two cases recorded in the work of Sir A. Cooper, in one of which there was a fracture of the atlas, consequent upon violence, in which too, the odontoid process was set free, and by the pressure of which upon the medulla, death was eventually caused: —in the other, a fracture of the processus dentatus occurred without violence, during the time the patient was under treatment for a syphilitic affection; we may therefore presume that the bone was diseased. —A third case occurred a few days ago, in the Westminster Hospital, in which the anterior portions of the atlas and axis were affected by caries, the odontoid process was "broken off," but as no symptoms were produced which would indicate a displacement of that process, it might have been detached during the examination after death.

In the present case, not only was there fracture and great displacement of the atlas, but a fracture and displacement of the processus dentatus, without any material disturbance of the functions of the economy. The blow was received upon the postero-superior surface of the occiput, the impetus was directed ob-

liquely downwards and forwards in the course of a line, drawn from that point, as nearly as may be through the occipito-atloidal articulation. A portion of this ring of the atlas, immediately posterior to the articulating surfaces, is comparatively unsupported; this portion gave way, and the anterior portion was propelled downwards and forwards, between the axis and the pharynx, the posterior portion remaining as nearly as may be in situ.

The body of the atlas being thus displaced, one of two things was necessary, either that the odontoid process should be fractured, or that the transverse ligament by which it is attached to the atlas should be ruptured; in this case the former contingency obtained, and to this circumstance the patient owed his life.

Cases occasionally occur in which the fragility of bones is so great, that a comparatively inconsiderable injury may produce fracture; such was, probably, one of the cases mentioned by Sir A. Cooper:—an inspection of the accompanying preparation, must convince every one that the present was not such a case. It is therefore very extraordinary, that the violence which was necessary to produce such a result, even though the medulla spinalis escaped immediate injury, was not followed by consequences which would have placed that organ in great peril.

When the examination was made there was scarcely any appearance of condensation of the surrounding tissues, or indeed any thing to warrant the idea that ther egion had been the seat of so much violence.

There are many cases on record where the bodies and other portions of vertebræ have been fractured without destruction of life; there are others where from caries of the bodies of vertebræ, the medulla has lost its natural protection, and where the anterior ligaments have performed that function; there are others where deformity of the column has been so great, that the anterior surfaces of the bodies of superior, have come into contact with the like surfaces of inferior vertebræ, as in a case described and figured by Cruveilhier *, where the medulla was even flattened, or as in a case which is described by Mr. Lawrence, of which the preparation is in the possession of Mr. Langstaff; but none of these cases have any parallel with the present case. Why, during life, there was an absence of those symptoms which the injury would lead us to expect, it is easy to explain: there was no lesion of the spinal cord.

As a point of practice, this case is comparatively unimportant from the extreme rarity of its occurrence; but in two other points it is not wanting in importance:—as an example of the extent of injury which may be experienced by this portion of the spinal column, without harm to the important organ whose natural protector it is, or even to the economy: and as a reason for rescinding the dicta that "a fracture of the processus dentatus proves instantly fatal," and "that a fracture of the cervical vertebræ (above the third) with considerable displacement, is almost immediately fatal."

* Anat. Pathol. Liv. IV. Plate IV.

SOME PARTICULARS

OF

A CASE

IN WHICH THE PATIENT WAS SAVED FROM THE DESTRUCTIVE INFLUENCE OF OPIUM,

BY

ARTIFICIAL RESPIRATION.

By CHARLES IRVING SMITH, Esq.,

ASSISTANT SURGEON IN THE MADRAS ARMY.

WITH PRECEDING REMARKS,

By JOHN HOWSHIP, Esq.,

VICE PRESIDENT OF THE SOCIETY, SURGEON TO THE CHARING CROSS HOSPITAL, AND LECTURER ON SURGERY.

READ FEB. 9TH, 1836.

The following is the outline of the case to which I referred, at the last meeting of the Society: a case in which the importance of artificial respiration, as an occasional means of saving, or even restoring life, is seen perhaps in its strongest and most striking point of view: a case which I have for some years been in the habit of mentioning in my lectures on surgery, in reference to the deleterious influence of opium; and one, the treatment of which reflects no less credit upon the humanity, than upon the professional talents and zeal of Mr. Charles Smith, a gentleman then attending my lectures, who, having

the immediate care of the patient, kindly favoured me with the following account.

This case appears to possess several features of considerable interest. It demonstrates that where from the destructive influence of opium the attempts to excite vomiting fail, and where, by the assistance of the stomach pump, that organ has been cleared of its contents without relief; where, in short, the circulation, respiration, and temperature have so far declined, as to be scarcely perceptible, the keeping up for a time the action of the chest, by the most simple form of artificial respiration, may sustain the powers of vitality until, the deleterious influence of the poison being worn out and exhausted, the patient shews signs of returning consciousness and power, at length revives, and eventually recovers.

Jane H., (æt. 25,) a stout young woman, was brought into the St. Marylebone Infirmary, July 20, 1828, under the following circumstances.

At six in the morning, she was observed by one who slept in the same room, to swallow something from a cup, the remains of which was opium. She shortly after became insensible. At 10 A.M. she was brought in. At this time, her extremities were cold and livid; the lips and face of a dark lead colour, the pulse fluttering, and scarcely perceptible at the wrist. Respiring three or four times in a minute, with sighing.

The stomach pump was applied, and that organ was carefully washed out, first with water, then with

dilute acetic acid; after which, small quantities of ammonia were injected, combined with brandy. The spasm of the œsophagus was so great, on attempting to introduce the tube of the stomach pump, as nearly to destroy it.

The patient was now, (11 A.M.,) evidently worse than at the time of her admission; so much so, that many doubted if she still lived. The hair was next entirely cut off from the whole head, and the head placed over the edge of the bed, several buckets of cold water were poured in rapid succession over it; the nostrils being at the same time stimulated with volatile alkali. The pulse now intermitted much at the wrist, at one time being 70 or 80 beats in the minute, and the next sinking as low as 7 or 8. Respiration had now nearly ceased.

The scalp was now rubbed with the Liq. Ammoniæ, until the entire of it was vesicated.

11½ A.M., it was determined, as the only remaining chance, to try the effects of artificial respiration; there being at this time no pulse whatever at the wrist, and only a slight irregular action at the heart, indicative that life was not quite extinct.

The mouth and one nostril being closed, a pair of common bellows was applied to the other nostril, and the chest was in that way inflated, and alternately emptied by pressure on the chest and sides. This was continued for an hour, without intermission, at which time the heart seemed to be rallying, but if left to itself, it rapidly sunk again. An ounce of the

ol. Terebinth. was injected into the rectum. Bottles of hot water were applied to the chest, and sinapisms to the feet and legs.

The same treatment was continued till 2 P.M., with only very slight intermission. She was at this time so evidently rallying, that it was deemed safe to leave her.

She was again seen at 3 P.M., when she was found relapsing into her former state. Recourse was again immediately had to artificial respiration, which was continued till 5 P.M., at which time it was suspended, on account of the pulse having become regular, and her having made some slight attempts to move; and shewing evidence of pain on being pinched.

At 12 P.M., she became slightly sensible, and swallowed a little tea. She became eventually well; and has since married.

It was curious to see the effects of artificial respiration in this case. The livid colour of the face and extremities, rapidly giving way to a more florid hue, on every inflation, and again as rapidly returning to its original colour, on being left for a few minutes.

REMARKS

ON

TWO FORMS OF ATROPHY

OF

THE HEART'S VALVES,

WHICH

INTERFERE WITH THEIR FUNCTION:

FOUNDED ON A SERIES OF CASES.

By PETER NUGENT KINGSTON, M.D.

PHYSICIAN TO THE ST. GEORGE'S AND ST. JAMES'S DISPENSARY.

READ FEB. 23RD AND MARCH 8TH, 1836.

I OBSERVED nearly five years ago that the heart's mitral and tricuspid valves were subject to a lesion not hitherto described by authors. Having since met with numerous cases, in eight of which its peculiarities were strongly marked, and its extent considerable, I now venture to submit to the Society a few remarks on its history.

I. *Anatomical Characters.*

The lesion may be defined a simple shortening of the heart's mitral or tricuspid valve, without any diminution of its natural thinness, pliancy and transparency: the orifice to which it belongs possessing at

least the ordinary calibre. In other words, it is an atrophy of the valve in the direction of its length. The extent to which the valve is thus wasted is often considerable. Thus, the length of the posterior lamina of the mitral valve, which is naturally from seven to nine lines, was in one case reduced to three lines: in another it no where exceeded a line and a half, and was for the most part only a line. The laminæ of the tricuspid valve are naturally from eight to eleven lines in length: but in one of my cases they all three fell very far short of this, and one was only three lines. The valves in question are generally thinner than is natural: but as attenuation does not interfere with the fulfilment of their function, it does not of itself constitute disease.

There is another lesion to which all the heart's valves are subject, so nearly allied in its nature and effects to the foregoing that I shall consider it at the same time. The continuity of a valve so affected is interrupted by apertures, sometimes of large size, and sometimes so numerous as to reduce the structure to a mere net-work, while the remainder is in a state of attenuation which is here and there often extreme, especially towards the edges of the apertures. Sometimes a large gap is seen, subdivided only by a few thready fibres. These in the case of the auriculo-ventricular valves, are generally prolongations from chordæ tendineæ. In at least four of the cases which have occurred to me since I first observed it three years ago, the lesion had gone to a sufficient extent to have materially interfered with the valve's function.

Dr. Davis of Dublin, to whom, while in London last August, I communicated these researches, has lately favoured me with a very interesting case of this form of atrophy, which I shall consider as one of my data through the remainder of the essay.

This cribriform character of the valve, as connected with attenuation, I had long believed to be also unnoticed by any author; but sometime after the composition of this paper I met with the following observations by Laennec. "Les valvules peuvent aussi présenter des vices de conformation, moins importans, il est vrai, mais qui ne laissent pas que d'être gràves. On rencontre quelquefois de petites ouvertures à bords lisses et oblongues sur les diverses valvules du cœur. J'en ai vu sur la valvule tricuspide qui par leur rapprochement présentaient un réseau très étendu."* This is the only allusion made by any author to the affection, in as far as the pulmonary and auriculo-ventricular valves are concerned. But while correcting this paper for the press I have been referred to a valuable paper by Dr. Corrigan, in the Edinburgh Medical and Surgical Journal for 1832, in which the cribriform condition of the *aortic* valves is thus described: "The valves may be absorbed in patches, and thus become reticulated, and present holes through which the blood flows back into the ventricle."

It now and then happens that valves which have become thickened and indurated in various ways are shortened or cribriform. In a case cited by Burns, on the

* Traité de l'Auscultation, Tome II. p. 549.

authority of a friend, it is said, "The mitral valve was indurated and reticulated." Illustrative of the shrinking which may attend inflammatory thickening, was a case I met with in 1831. The patient, who was a waiter at an inn, aged 27, had during the last four years of life had several attacks of acute articular rheumatism. These were always attended with violent precordial pain and palpitations, which abated but did not subside in the intervals of the attacks. For four or five weeks before death there were cough and dyspnœa, anasarca, and ascites.—The posterior lamina of the mitral valve was yellow, opaque, much shortened, and the sixth of an inch in thickness. The adjacent portion of the inner membrane of the left auricle, for the extent of about two inches, was much thickened and corrugated, opaque, and of nearly the same hue as the valve. The whole heart was dilated and hypertrophous: the left auricle had twice the capacity of the right. The pericardium contained about a pint of yellowish serum: it was otherwise healthy. The pleuræ and peritonæum likewise contained a good deal of serum. The lungs and liver were congested.

In Bouillaud's recent work* it is remarked, "The cartilaginous, ossified, and petrified valves undergo changes of conformation the most different. In some cases their laminæ are turned in and rolled upon themselves, and then represent a sort of narrow ribbon; they are too short and too rigid to be able to close the orifice at which they are placed." But neither

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Bouillaud nor any other writer has noticed that, while shortening is sometimes an accident of the various kinds of thickening and induration to which the valves are subject, it not unfrequently exists as a separate lesion, constituting the only deviation from the natural condition.

II. *Comparative frequency.*

That these are far from being rare lesions in comparison with the others to which the heart's valves are subject, may be inferred from the circumstance that out of about thirty fatal cases of diseased valves of which I took notes during a definite period, one or other of these species of atrophy existed in ten. The mitral valve was shortened in five, the tricuspid in five, both in two. In one the mitral valve was cribriform, in two the tricuspid, and in one both the aortic and pulmonary valves were so.

How then, it may be asked, has it happened that, notwithstanding the heart's lesions have excited more interest than those of almost any other organ, these should so long have escaped notice? The oversight may be partly accounted for on the ground that the lesions in question are above all others likely to elude observation, until the attention has once been directed to them. If the valves are in a cartilaginous or osseous condition, or occupied by vegetations, the change is such as immediately to strike both the eye and the touch. But if they are lying down against the side of the ventricle or artery without any deviation from the natural appearance except a diminished

extent of surface, their defect, though obvious when pointed out, is of a kind easily to pass unnoticed. It is indeed often necessary, before the length or integrity of surface can be accurately ascertained, to cut the chordæ tendineæ and lift up the valve under examination.

III. *Functional effects, and diagnostic signs.*

A valve which has become shortened or cribriform is of course incompetent to close completely the orifice to which it belongs: and hence permits that regurgitation which it was placed to prevent.* This insufficiency of the valve forms a counterpart to the lesion already well known, in which, while the valve remains unchanged, the orifice becomes dilated. Its effect must obviously be to weaken the force with which the blood is propelled through the arterial system, and to favour its accumulation posteriorly to the affected valve. This effect will be in a great measure proportioned to the extent of the valvular deficiency and to the size of the corresponding orifice. When dependent on shortening, it will also be liable to increase from bodily exertion: for it was shewn by Mr. Hunter † that the heart at its diastole dilates much more while the body is in activity than while at rest; and it is evident that when an orifice has become un-

* It is generally admitted that the valves, in the natural state, are but just large enough for their office; and Mr. Hunter had "reason to believe that the valves in the right side of the heart do not so perfectly do their duty as those of the left."

† On the Blood, &c.

usually dilated at the diastole, its valves, if shortened, will at the succeeding systole be still less able to meet than they were before. Mental emotions and other circumstances by which the heart's action is stimulated, will promote the operation of this lesion in the same way.

From this disablement of the valve will hence arise a strong tendency to dilatation or hypertrophy of those parts of the heart posterior to the valve affected; to palpitation, venous congestions, anasarca and effusion into the serous cavities; and where the mitral or aortic valves are defective, to dyspnœa and cough, to pulmonary congestion and inflammation, and to some of those symptoms which are apt to arise from deficient and irregular supply of arterial blood to the head and remote parts of the body. At the same time it may be presumed that the degree of tendency to the production of these affections, is less than that of those diseases of the valves which not only permit regurgitation, but likewise by narrowing the orifice obstruct the passage of the blood in the natural direction.

These two species of atrophy sometimes co-exist or are combined with other defects of the valve or its orifice: and then, though each be slight, their united influence may be considerable. Thus, in some of my cases the orifice was dilated in one, the posterior lamina of the mitral valve was both shortened and cribriform, and the anterior lamina was indurated: in a case where the tricuspid valve was affected, one lamina was cribriform, while the other two were con-

nected at their apices by a transverse band having all the appearance of healthy valvular structure.

Thus far we can confidently advance by the aid of established principles in physiology and pathology. And it is fortunate that we can do so; for as these diseases are most frequently found combined with other impediments to the circulation, it would by cases alone be difficult to prove in a decisive manner how much of the symptoms appertained to each. As it is, no more is required than to shew that the cases observed are not in contradiction with the conclusions thus clearly pointed out by physiological and pathological principles.

In all the cases in which the circumstances are fully detailed, there had been anasarca and palpitations; and in all but one, dilatation of some cavity posterior to the affected valve. In all in which the valves of the left side were defective, there had been dyspnœa and cough, pulmonary congestion and inflammations: the radial pulse and the precordial impulse were frequently irregular and unequal; and out of the only four of these cases in which the history is sufficiently known, one patient was very subject to attacks of faintness and debility, another to vertigo and epileptic fits, a third died in a fit of syncope, and the fourth, after total sleeplessness for a fortnight, sunk into a state of coma which was fatal in a few hours. Where the defect lay in the mitral valve, the pulse at the wrist, compared with the beat at the heart, was generally small and weak; and where in

the tricuspid, there was distention, sometimes attended with pulsation of the external jugular veins; in those cases, at least, in which they were examined. In several, the symptoms could not have been fully accounted for, had these valvular lesions been overlooked.

Further experience is required to shew with precision by what modifications of the heart's sounds these defects are characterized. But I am satisfied from the stethoscopic examinations which I made, and from many analogous instances of simple regurgitation *, that a bellows sound is often produced during the reflux of the blood through the affected valve.

By a reference to these symptoms, and to the circumstances out of which the complaint arose, it may generally be ascertained during life whether or not there is valvular disease. The discrimination of these from

* The only other lesions which modify the heart's sounds by simply permitting regurgitation, are dilatation of one of the heart's orifices, adhesion of a valve to the adjacent surface, and, as was first noticed by Dr. Hope, "contraction of the chordæ tendineæ." It is strange that M. Bouillaud, in 1835, should affirm, "Je n'ai observé que cinq ou six fois l'adhérence des valvules auriculo-ventriculaires aux parois du cœur, lésion qui n'avait encore été signalée par aucun des auteurs, qui ont traité des maladies du cœur *ex professo*:" when Dr. Elliotson, five years before, in one of the most distinguished works that have appeared on the diseases of the heart, had given three cases from his own experience, and one from another author, in which a part of the tricuspid valve was "bound down," and in explaining one of the plates, had observed that "one half of the tricuspid valve was completely adherent to the ventricle."

the other lesions of the valves is a point of great nicety, on which I am not yet fully prepared to speak *.

IV. *Mode of Production and Causes.*

It is possible that these defects may now and then be congenital. But there is no evidence whatever to shew that they ever are so; and there are the strongest reasons for believing that in the great majority of cases they occur at periods subsequent to birth.

I shall hereafter shew that they are in their nature closely analogous to other lesions which take place after birth; and that in all the cases causes had occurred, which are known to produce in other parts of the body effects of the same kind. In four out of the five cases in which the valves were cribriform, and in six out of the eight cases in which they were shortened, the patient had reached middle or advanced life, before the symptoms of obstructed circulation manifested themselves; though they had most of them followed laborious occupations, as those of cook, sailor, and carpenter, and several had been given to excess in spirituous liquors. Could this

* I cannot agree with Dr. Corrigan in considering visible pulsation of the arteries of the upper part of the body as pathognomonic of permanent patency of the aortic orifice: for in several instances in which after death I found the aortic orifice permanently patent, these arteries had exhibited no visible pulsation; while in some of the most striking instances I have met with of this visible pulsation, the aortic orifice was free from defect of every kind, and in others, the defect was such as to produce much obstruction, but little or no regurgitation.

have been the case in so many instances, had the heart's valves been from birth materially defective?

By what mode of action then, was the size of the valves thus curtailed; by ulceration, by simple progressive absorption without suppuration, or by interstitial absorption?

The supposition of ulceration would be highly improbable. Ulceration of the heart's valves must be extremely rare, as notwithstanding the numerous opportunities which have occurred of examining them at all stages of their inflammations, and notwithstanding the eagerness with which proofs of inflammatory action have been looked for, there is but one decided case of their ulceration on record, and in that it had not proceeded to perforation. The case is given by Bouillaud as one of ulceration, but without any detail of the marks by which the breach of texture was characterized. In the cases at present under examination the valves presented appearances exactly opposite to those which attend ulceration: they were thinner, more pliant, and more transparent than natural, and the attenuation gradually increased towards the edges of the perforations.

These appearances are on the other hand most characteristic of those species of absorption unattended with suppuration; and I shall presently shew that in all the cases, some of the commonest and most efficient causes of these actions had been applied.

Of these two species of absorption the apertures can of course be ascribed only to the progressive;

and in two cases at least in which the valves were both shortened and cribriform, the shortening was most likely produced by the same process as the apertures, by a progressive absorption of a portion of the valve at its free edge.

The remote causes of these lesions remain to be investigated.

In nine out of the ten instances in which the mitral or tricuspid valve was shortened, there was hypertrophy of the corresponding ventricle, which is in general preceded as well as attended by an increased force of the heart's contraction. In several, there was likewise obstruction to the discharge of the blood from the hypertrophous ventricle. In most, the patients had followed laborious occupations; and two traced their complaints in a great measure to overexertion.

In these nine instances, therefore, the blood's impulse against the valve affected had been permanently increased, and the valve had hence been subjected to an unnatural degree of pressure, an agent very frequently observed to occasion the atrophy of almost every tissue and organ in the body. The absorption of the sides of the vertebræ from undue inclination of the superjacent portion of the spine; of the spinal cord from the encroachment of displaced vertebræ; of the renal structure from the pressure of neighbouring tumours; of the hepatic structure from the pressure of tumours or distorted ribs; of the cellular substance from the progress of abscesses and encysted tumours towards the surface, afford familiar illustra-

tions. Professor Thomson, of Edinburgh, saw "a case of ascites abdominalis in which the integuments had become so thin, that after the water was drawn off by a trocar, the peristaltic motion of the intestines could be distinctly seen through them:" and has "seen similar absorptions of the cellular substance in cases of femoral, scrotal, and umbilical herniæ."* Cruveilhier remarks that "Atrophy of the lymphatic glands soon succeeds their hypertrophy, when the effused juices come to exert a considerable pressure on their glandular structure."† Portal, Laennec, and Bouillaud have met with cases in which the muscular substance of the heart has become atrophized by the pressure of pericardiac effusion. It is well known, with how much success the influence of pressure is frequently resorted to in medicine and surgery for the removal of morbid growths and fluid accumulations.

I may add the following illustrations of the absorption of serous and fibro-serous membranes under the influence of pressure. When ossific deposit takes place under the inner membrane of the heart or arteries, that membrane, at first entire, gradually becomes absorbed at the parts where the pressure of the deposit is most considerable.—A case is related by Mr. Hunter in which a tumour formed in the pia mater or brain, "had, by pressing against the dura mater, produced the absorbing disposition in that membrane, so that this membrane was entirely gone at that part. The same irritation from pressure had

* Lectures on Inflammation.

† Dict. de Medecine et de Chirurgie. Art. Hypertrophie.

been given to the skull, which also was absorbed at this part; after which the same disposition was continued on to the scalp. No matter was to be observed here from either the dura mater, the unconnected edges of the bones of the skull, nor from that part of the scalp which had given way."*—A case occurred some years ago at St. George's Hospital, in which a number of little tumefactions of the surface of the brain had by their pressure caused a complete removal of the portions of dura mater above them, and had formed for themselves little receptacles in the skull. Here again there was no appearance of suppuration.—In an old woman who had for some years before death been obliged to work beyond her strength, and been subject to violent palpitations, I found the heart generally hypertrophous, and the left side of the pericardium in a state of extreme attenuation, with here and there a deposition of fat externally to it. In one place where it was adherent to the left lung, the pericardium with the two pleuritic laminæ did not altogether exceed the thickness natural to a single lamina of pleura. In this case I conceive the extreme attenuation of the pericardium to have been partly owing to the friction of the hypertrophous and over-exerted heart.

From these and other instances of the influence of pressure it might have been expected that the blood's impulse, when preternaturally increased, would in some cases have the effect of atrophizing the valves. That the blood may sometimes act on the parts

* On the Blood, Inflammation, &c.

against which it is propelled as continuous pressure acts upon other parts, is shewn by the absorption of the diseased coats of arteries from merely the ordinary pressure of the moving blood, as remarked by Mr. Hunter; and by the total or partial absorption of the venous valves, when strained, as proved by Meckel *.

There can, therefore, be no doubt that in the cases at present under consideration, the undue force of the blood's impulse against the valves may have been powerfully instrumental in promoting their atrophy. It could not, however, have been singly sufficient: for in some cases it has not at all impeded their nutrition, and in others it has been followed by an opposite change to that now considered. Dr. Hope and M. Cruveilhier assign it as one of the causes of the cartilaginous and osseous degenerations of the valves. I have further observed that in many such cases, the valves, without undergoing any change of structure, have simply acquired a moderate augmentation of thickness, by which they have been enabled to meet the increased demand upon their strength.

The undue force of the blood's impulse, therefore, in order to atrophize the valve, must have been assisted by some other cause. In the nine cases at present under review the only cause that can be supposed is a debility of the valve's nutritive powers, in consequence of which its nutrition was obstructed by a degree of pressure which, had these been vigorous, they would have been able to withstand.

* Anatomie Générale.

This kind of local debility has been remarked in other organs and tissues of the body; having been in many instances seen to depend on chronic disease of the part, or on other circumstances diminishing its supply of arterial blood, while in some its origin has not been apparent. In five out of the nine cases, marks of chronic disease were exhibited either by the pericardium, by some of the other valves, or by the inner membrane of the heart or aorta. In these five the valvular atrophy was probably consecutive on disease, with which the valve had been affected at the same time.

To account for the valvular hypertrophy sometimes induced by increased pressure, it is necessary to call to mind that resistance to the blood's natural impulse is what constitutes the essential office of the valves, being to them what walking and running are to the muscles of the lower extremities; and that, therefore, an increase in the force of this impulse forms an augmentation of the duties of their function. Now it is a well established law of the animal economy, that increased exertion of a part in the discharge of its function has a tendency to stimulate its nutrition and occasion its enlargement. When, therefore, the nutritive powers of the valves are so vigorous as not to be embarrassed by the increased pressure, they will be stimulated to unwonted activity by the additional onus which the valves have to sustain.

From a similar difference of nutritive energy it is, that when obstructions occur to the discharge of the blood from the heart's cavities, its parietes in some in-

stances become hypertrophous, while in others they undergo a passive dilatation without any acquisition of muscular substance to render them equal to the increased exertion required of them. Indeed, in some cases in which the right ventricular cavity had become dilated from impediment to the pulmonary circulation, I have found the muscular substance absolutely diminished; and in a recent case of this kind, the parietes of the right ventricle consisted principally of a thick layer of fat, with a lamina of muscle which in some places did not exceed the thickness of a shilling.

To the causes here assigned for the simple hypertrophy and atrophy of the valves, may be traced several cases I have observed in which these states were combined; in which, the contractile force of the ventricle being increased, the auriculo-ventricular valve has been thickened at its tendinous zone and at the insertions of the principal chordæ tendineæ; while the remainder of the valve, being more scantily supplied with vessels, has for the most part become extremely attenuated, and in some places been entirely absorbed away.

We now proceed to the causes of the cribriform atrophy. Of this there were five cases, in one of which the pulmonary and aortic valves were both affected: in two the auriculo-ventricular valve was shortened as well as cribriform.

One of these patients had been very subject to gout and to precordial palpitations; and two had had several attacks of acute articular rheumatism, attended with well-marked symptoms of inflammation

of the heart; and after death exhibited old adhesions of the pericardium, and disease of some of the valves similar to that which is known to be consequent on rheumatic affection of the valves.

Are gouty and rheumatic actions capable of so impairing the nutritive powers of a part in particular constitutions, as to render it liable to be absorbed under the degree of pressure to which it is naturally subjected? In proof that they are, I may cite the following passages from Sir Benjamin Brodie's work on the joints:—"The effects of gout on the joints are very remarkable. The cartilages are absorbed." Again, "The peculiar kind of absorption of the cartilages which is described in pages 311 and 312, as one of the effects of gout, occurs also in some of those cases of chronic rheumatic inflammation, which are often distinguished by the appellation of rheumatic gout. The process by means of which this absorption is effected is manifestly different from ulceration."

That rheumatic action, while it in some cases thickens the valves, may in others render them liable to be partially absorbed from the blood's friction, is confirmed by the following case, which I have not previously alluded to. A man, who died at the age of forty-two, had from boyhood been subject to acute attacks of articular rheumatism, which during the last five years were attended with severe heart symptoms. The mitral orifice was extremely contracted from cartilaginous and osseous degeneration. The aortic valves adhered to one another, and were for the most part thickened: but they presented several

large apertures, around which their structure was much attenuated.

In two of these three cases, the heart's muscular substance presented a singularly pale, friable, flabby condition, unequivocally proving extreme languor of nutrition: and in one of the two, there was a deposition of fat by the side of the cribriform valve, strengthening the analogy between this atrophy and the atrophies of other organs depending on failure of nutrition.

In the remaining two of the five cases, the cribriform atrophy was referable to the causes which have been assigned for the shortening; namely, to an undue force of the blood's impulse, combined with debility of the valves' nutritive powers from previous disease. The first circumstance was proved in both by hypertrophy of the corresponding ventricle, and obstruction to the discharge of its blood: the second was in both rendered probable by marks of chronic disease of the heart's valves in other places.

In considering this cribriform atrophy as the result of disease after birth, and as sometimes referable in part to increased pressure, I am happy to find myself confirmed by the explanation which Meckel has given of the same defect when occurring in the valves of the veins.

From the foregoing observations it may be inferred that these forms of atrophy of the heart's valves are most frequently owing either to local debility connected with undue force of the blood's impulse, or altogether to a degree of local debility (often conse-

quent on gouty or rheumatic action) so great as to render the valves liable to be absorbed under the degree of pressure to which they are naturally subject.

V. *Prevention and Treatment, and other practical bearings.*

1. When there have been post-mortem examinations of cases in which this lesion existed, but in which it passed unobserved, the symptoms to which it had given rise during life have necessarily been referred to some other cause. Thus, if this lesion had communicated to the ear of the stethoscopist a morbid murmur, the case has been considered as affording an instance of morbid murmur independent of valvular disease. Whenever it has occasioned, or helped to occasion palpitations, syncope, dyspnœa, dilatation of the heart's cavities, or dropsy, some concomitant or hypothetical lesion must have unjustly borne the blame. Hence have been deduced erroneous conclusions respecting the nature of diseases, and the diagnostic import and value of symptoms; which a knowledge of these lesions will rectify.

2. From what has been said of their causes, we may expect to diminish the frequency and severity of these lesions by avoiding those circumstances which are known to encourage inordinate action of the heart, and by studying to prevent the metastasis of gout and rheumatism of the heart, and to improve its treatment when it occurs.

3. To distinguish during life these lesions from those which are attended or supposed to be attended

with chronic inflammation of the valves, is desirable, as bearing immediately on the treatment of both: since some of the means advantageously resorted to for subduing inflammatory action, and inducing absorption of inflammatory depositions, are not always proper in cases of atrophy where no inflammatory action or deposition exists.

4. But the diagnosis of these lesions, even so far as to know that there is *some* valvular defect obstructing the circulation, will be highly advantageous to the patient.

If the lesion be undetected, the symptoms will be supposed to indicate some other disease, as hysteria or dyspepsia: and hence a wrong opinion will be pronounced in regard to the future progress and the termination of the case; and, what is more material, the appropriate remedies will be neglected, while others, calculated perhaps to injure the constitution and increase the real disease, will be exhibited.

It is generally agreed that, in valvular disease, the more distressing and fatal symptoms with which it is often attended, do not occur until the supervention of hypertrophy and dilatation. By a judicious employment of remedies, and regulation of the patient's habits, these consequences may often be warded off for a long term of years. The means adapted to this end need not for the most part be specified, as they are identical with the palliative treatment of the other purely mechanical valvular lesions. But I may remark, that while great muscular exertion is of all things the most injurious, a good deal of very gentle

exercise, by determining the blood to the remote parts, and relieving the heart and great vessels of their distension, is in many cases highly beneficial.

5. It might at first be thought certain that, however the symptoms may be alleviated, the lesion itself is incapable of removal or even of diminution. But it is not unlikely, that if the heart's action can be kept tranquil, and the quantity of circulating fluid be reduced, the orifice and cavities to which the defective valve belongs, may gradually diminish in calibre, so as to become adapted to the altered size of the valve.

I have met with cases in which, one of the heart's orifices being dilated, its valve has enlarged in a proportionable degree. From this fact, and from what is known of the renovating powers of nature, a hope may be derived, that where we can remove the causes by which the valve was originally atrophized, its structure may sometimes be restored to its original dimensions.

A CASE

OF

UNUSUAL DISLOCATION

OF

THE THIGH-BONE,

WITH OBSERVATIONS.

By BENJAMIN TRAVERS, Jun.,

DEMONSTRATOR OF ANATOMY AT ST. THOMAS'S HOSPITAL.

Communicated by his Father.

READ APRIL 12TH, 1836.

Two cases of dislocation of the thigh-bone, in a direction upwards, have recently appeared in the Reports of Guy's Hospital, which bear strongly upon the following narrative. A succession of these injuries, termed unusual, because not hitherto described in any systematic work upon the subject, has induced me to submit to the Society another example of the accident, which occurred some years ago in the practice of Mr. Green, at St. Thomas's Hospital, and by whose permission the case is now presented to their notice. I can only regret that my report is not more in detail.

Nov. 1832. Edward Mecklam, a sailor, æt. 19, states that eight months ago he fell into the hold of a ship, the left buttock striking upon a coil of chain cable. The height might be about twenty feet. The limb on raising him, was immovable, everted,

and shortened; the difference being considerable. A complete retention of urine followed the accident, but the bladder recovered after the lapse of two days, though the secretion remained turbid for some time.

He did not land in England until four months afterwards, when two attempts were made to reduce the limb without success. He has never suffered from cramp, but the left knee was much swollen after the accident. He describes himself as having met with many severe falls on first attempting to move from his hammock, at the distance of eight weeks from the time of injury. He used to slip up and tumble backwards, with the leg of the affected side under him. The left buttock is flattened; the trochanter is felt rather below and to the outer side of the anterior and superior spinous process of the ilium. The neck of the bone lies apparently between the two anterior spinous processes, so that, when the patient is erect, the limb appears slung or suspended from this point. The head of the bone cannot be felt; it is invested by an abundance of bony matter, which extends backwards and inwards over the brim of the pelvis and iliac vessels, occupying in front, nearly the whole space between the inferior spine of the ilium and that of the pubis respectively. There is complete eversion, slight mobility, and imperfect progression with the aid of a crutch.

The above case I conceive, closely resembles that given to the profession by Mr. Morgan, in the Journal before alluded to. Mr. Bransby Cooper's case, (to be found in the same work,) is one of partial disloca-

tion upwards, and the possibility of such an accident would appear to be well established by his interesting memoir. I have carefully inspected the preparation in the museum of Guy's Hospital, and feel satisfied that it differs widely from the instances of complete displacement upwards, above mentioned. It is the place of the trochanter major which marks the distinction: and the case in question well illustrates the effort always made by the muscles to maintain the shaft of the bone, surmounted by this large process, in the direct line of support, or at any rate to permit as little aberration as possible. On inspecting either bone at the point of contact, it will be seen that an extended plane has been wrought upon the summit of the trochanter major, perfectly smooth, and corresponding accurately to the upper border of the acetabulum, where a corresponding surface occurs. To this point were the functions of the former joint transferred.

The progress of our practical knowledge of hip-dislocations has been extremely slow; indeed, for fifty years or more preceding the present era, little or nothing was placed upon record concerning these accidents. It is said, that Mr. Sharpe discredited the possibility of their occurrence. Petit approaches the subject with much ingenuity. He writes like a man who draws his pathological inferences from a survey of the healthy structure, rather than a practical familiarity with the injury. Thus he hints at a necessity which exists for the passing of the head of the bone inwards in the larger proportion of cases,

which he erroneously supposed to be the fact. He declares the displacement upon the dorsum ilii to be rare, and wholly discards the luxation downwards and backwards (sciatic notch) as impossible. It was reserved for Sir Astley Cooper to achieve a work which leaves little to be desired, an instructive digest of all that is generally known upon the subject of dislocation; still, like all human labour, it is open to those additions and corrections which time and opportunity cannot fail to supply. For example, in addition to the instances above cited, there have occurred cases where the head of the luxated bone, taking only a different direction, has assumed an equally new and unusual position. Mr. Stanley, of St. Bartholomew's Hospital, has kindly permitted me to make mention of two very valuable preparations in the Museum of that institution. They both exhibit the possibility of displacement, not merely backwards, but *downwards* also. In the first, which was removed one week after the receipt of the injury, the head of the bone is seen resting upon the sciatic spine and lesser sciatic opening. The lower border of the cervix femoris being partially in contact with the upper and outer edge of the tuberosity, the small rotator muscles at the back of the joint are lacerated. The lesser glutæi and pyriform muscles are entire at their place of insertion. A notable feature of this case is that fracture of the os innominatum traverses the bottom of the acetabulum, terminating where the rami of the ischium and pubis join. The trochanter lies higher considerably than

the head of the bone, encroaching upon the lower and outer segment of the acetabulum.

In the second specimen, the bone had been reduced, but the rent is plainly seen at the back and outer part of the capsule, through which the head of the bone passed. The latter was found during life to be movable upon a spot corresponding to the root of the spine of the ischium. In reply to an inquiry as to the mode of injury, Mr. Stanley favoured me with the following statement.

"In the case of dislocation downwards and backwards, in which the reduction was not attempted on account of other injury which destroyed life, the man jumped out of a window, at a considerable height from the ground. In the case presumed to have been the same kind of dislocation, the man was riding behind a coach, and his legs became entangled between the spokes of one of the wheels. The consequence was a compound fracture of one femur and the dislocation of the other at the hip-joint."

In the tenth volume of the Medical Gazette, at p. 19, Mr. Keate has given an account of a case which is, perhaps, on the whole, the most genuine instance of the dislocation downwards yet recorded. Amongst other symptoms, Mr. K. mentions, "Limb lengthened three inches and a half, flexed and everted. Trochanter much *sunk*. Head of the bone close to and on a level with the tuberosity of the ischium, where it was capable of being moved under the finger."

In accordance with the above observations, it would

appear that if there be four lines of direction in general, there are six particular dislocations of the head of the thigh-bone. First, as to direction, the displacement may be either upwards, downwards, inwards, or backwards (which also signifies outwards). Secondly, in addition to the four several luxations so accurately described by Sir Astley Cooper, of which two occur internally and two externally, with reference to the acetabulum as a centre, it must, I think, now be further admitted, that the head of the bone may assume a position either directly *above* or *below* the articular cavity. With respect to the dislocation downwards, the classification would be much simplified by referring all cases to this variety, where the head of the bone is found to rest below the plane of the spinous process of the ischium.

This form of the injury is probably of very rare occurrence. The amount of the force applied, no less than the unusual direction in which the bone is permitted to escape from its socket, tends to justify the conclusion that the acetabulum itself is not unfrequently implicated by simultaneous fracture, in the production of such an accident. This, however, is one of many questions which experience alone can decide.

PATHOLOGICAL AND SURGICAL

OBSERVATIONS

RELATING TO

INJURIES OF THE SPINAL CHORD,

By Sir BENJAMIN C. BRODIE, Bart., F.R.S.,

SERGEANT-SURGEON TO THE KING, AND SURGEON TO ST. GEORGE'S HOSPITAL.

READ MAY 10TH AND 24TH, 1836.

SECTION I.

As the spinal chord is an appendage of the brain; as the functions of the one are intimately connected with those of the other; as they are constructed alike of medullary fibres and cineritious substance, enclosed by similar membranes, and protected, each of them, by a strong bony case; it seems reasonable to expect that they should suffer, nearly in the same manner, from the effects of mechanical injury. Pathological and surgical writers (with very few exceptions) seem to have taken nearly this view of the subject, and hence probably it is, that while their works contain abundant information respecting the consequences of wounds and contusions of the head, so little can be learned from them as to the not less important

consequences of the same accidents, where they affect the column of the vertebræ.

It is with a view to contribute my share towards remedying this defect in surgical literature, that I venture to offer the following observations to the Royal Medical and Chirurgical Society. Those who have been much engaged in the practice of large civil and military hospitals will, I trust, discover in them no inaccurate representation of what they themselves have witnessed; while to the younger members of our profession, and to those whose opportunities are less extensive, it may be neither useless nor uninteresting to have placed before them a connected history of a class of accidents, which they must occasionally meet with; which are always attended with danger, and which at the same time lead the mind of the scientific enquirer to a variety of curious physiological and pathological speculations.

It is my intention not to occupy the time of the Society by giving a detailed account of individual cases, but rather to explain the general results of my experience; it being understood, that except where I expressly refer to the observations of others, I make no statements for which I do not find an authority in the written notes of cases, which I have been enabled to collect in the course of the last few years.

Wounds, which penetrate through the external parts into the spinal chord, are almost invariably fatal at a very early period; the examples of recovery from them, which have been recorded by writers

being very few in number, and leading to no important rules of surgical practice. On this part of the subject I have nothing new to offer from my own experience. Those who will take the trouble of referring to M. Ollivier's treatise on diseases of the spinal chord, will find in it a notice of some interesting experiments illustrating the effects of these injuries in animals, as well as the histories of some cases, chiefly collected from other authors, in which they occurred in the human subject.

In considering the other and more common varieties of injury of the spinal chord, I shall in the first instance, as the best foundation of our knowledge, endeavour to describe the effects of these accidents, as they are disclosed to us by dissection, where the patient has died at an early period after the infliction of the injury. Of course it is necessary to include in the description not only the effects produced on the chord itself, but also those on the parts which are in immediate connection with it. The whole of these may be classed under one or another of the following heads.

First. Fractures of the vertebræ without displacement of the fractured surfaces.

Secondly. Fractures with depression or displacement of bone, diminishing the diameter of the spinal canal, and occasioning pressure on the spinal chord.

Thirdly. Fractures complicated with dislocation.

Fourthly. Dislocations not complicated with fracture:

The existence of such dislocations has been doubted by some very distinguished surgeons, but Mr. Lawrence, in a paper on the subject published in the thirteenth volume of the Transactions of this Society, has not only recorded several cases in which they had taken place in the cervical vertebræ, but has also adduced satisfactory evidence of their existence even in the dorsal and lumbar portions of the spine. In a case, which came under my own observation, the fourth and fifth cervical vertebræ had been completely separated from each other, so as to expose the *theca vertebralis* for the extent of half an inch. Similar cases of diastasis have been described by Sir Charles Bell and Mr. Lawrence.

Dislocations of the odontoid process of the second cervical vertebra in consequence of disease, are not very uncommon, so that probably there are few surgeons of much experience, who have not had the opportunity of witnessing cases of this kind *.

Fifthly. Extravasations of blood on the surface of the membranes of the spinal chord. Such extravasations, however, rarely take place to any considerable extent, and bear no comparison to those which occur within the cavity of the cranium in consequence of a rupture of the substance of the brain, or a laceration of the middle meningeal artery.

Sixthly. A narrow clot of extravasated blood is sometimes discovered within the substance of the spinal chord. It is always of a very small size,

* See Rust, in Arthrokakologia: Lawrence, op. cit.; and my own Treatise on the Diseases of Joints.

but from its peculiar situation may be productive of the most dangerous symptoms.

Seventhly. Laceration of the spinal chord and its membranes. Of course it is more easy to conceive than to describe all the varieties of this kind of injury which are met with in practice. The spinal chord may be separated through its whole substance; or it may be torn in one part and not in another. M. Ollivier describes a case in which the attachments of the nerves on one side were destroyed, while those on the other side were entire.

Eighthly. The minute organization of the spinal chord may suffer from a blow inflicted on the spine, even where there is neither fracture nor dislocation, and where the investing membranes do not appear to participate in any way in the effects of the injury. In such cases, if there be an opportunity of examining the spinal chord at a very early period after the accident has occurred, the central part of it is found to be softer than natural, its fibrous appearance being lost in that of a semifluid substance. If the patient survives for a longer period, the alteration of structure is perceptible in the whole diameter of the chord, and occupies from one to two inches, or even more, of its length; and at a still later period it has often proceeded so far as to terminate in its complete dissolution.

This disorganization, softening, and final dissolution, of the spinal chord is the most common consequence of injuries of the spine, and the dangerous symptoms which follow these accidents, are, in the

majority of cases, to be attributed to it. It bears no distant resemblance to the effects of a contusion of those soft parts which are more superficially situated, and it is easy to understand that it may be produced by a severe concussion operating on the delicate medullary fibres and cineritious substance, of which the spinal chord is composed.

In a paper which I communicated to this Society in the year 1828, and which has been published in the fourteenth volume of the Medico-Chirurgical Transactions, I have observed that in what are commonly called cases of concussion of the brain, we are not justified in the conclusion, that because no changes are to be detected after death, "there is, therefore, in reality no organic injury." And I have added, "It is difficult to conceive in what other manner concussion of the brain can operate, so as to produce the effects which it is known to produce: and if we consider that the ultimate structure of the brain is on so minute a scale that our senses are incapable of detecting it, it is evident that there may be changes and alterations in it, which our senses are incapable of detecting also. The speedy subsiding of the symptoms in some cases of concussion does not contradict this opinion. A deep incised wound in other parts may, under certain circumstances, be completely and firmly united in the space of twenty-four hours, and it is easy to suppose that the effects of a much slighter injury may be repaired in a much shorter space of time." These remarks are not less applicable to cases of concussion of the spinal chord

than they are to those of concussion of the brain. We cannot doubt that the nature of the injury is the same in both of them. It is true that much worse consequences usually arise from concussion of the spinal chord than from concussion of the brain; that is, if the patient recovers, his recovery is more tedious: that if he dies, greater changes in the condition of the injured part are detected on dissection. But these differences in the effects of the injury are easily explained. The brain and its membranes completely occupy the cavity of the cranium, while the spinal chord and its membranes occupy only a part of the vertebral canal: and this being the case, it requires no great knowledge of mechanics to enable us to understand why the same degree of violence applied to the head, and spine, should occasion different degrees of mischief to the organs which they contain.

The effect of a violent concussion is at once to impair, and even to destroy the functions of the spinal chord, sometimes even causing the patient's death in the course of a few hours; and the question here presents itself, What is the nature of the injury thus inflicted on the spinal chord, so trifling in appearance, so great in reality, which is capable of producing such important and dangerous consequences? It would be an interesting experiment, but it is one which I have hitherto neglected to institute, where a patient has died at an early period after an accident of this kind, to prepare the spinal chord by maceration in alcohol, and to endeavour by tracing its fibres to ascertain in what respects they are altered

from their natural condition. The process of softening and dissolution of the chord which takes place afterwards has, I know, been regarded by some pathologists as the consequence of inflammation, but a consideration of the following circumstances leads me to doubt the accuracy of this conclusion. 1st. A minute examination of the injured part of the spinal chord will often enable us to detect the commencement of the softening process at a very early period, before sufficient time had elapsed for inflammation to become established, and before any symptoms of inflammation had shewn themselves. 2dly. The softened part of the chord, in the first instance, exhibits no appearance of increased vascularity. 3dly. Even where the softening process is so far advanced as to occasion complete disorganization of the spinal chord, the investing membranes, for the most part, exhibit their natural appearance, there being neither increased vascularity, nor the slightest effusion of lymph, or serum, or pus on their surface. 4thly. The symptoms, which mark the progress of these changes, are (as I shall shew hereafter) merely a continuation of those which the concussion of the spinal chord has occasioned in the first instance, and which of course must have been wholly unconnected with inflammation.

It is true that the disorganization of the spinal chord never proceeds to any considerable extent without an enlargement of the small vessels being perceptible, such as may be supposed to indicate the existence of inflammation: but this is no more than

what happens in the progress of any other disease. As far as I know there is no exception to this general rule. A scirrhous or fatty tumour is not the result of inflammation, but inflammation nevertheless takes place sooner or later as the disease makes progress. Nothing can be more remote from inflammation than neuralgia is in its origin; yet a slight degree of inflammation frequently takes place where neuralgia has been constant and of long continuance. In these and in a number of other cases, which might be enumerated, the inflammation is not the cause, but the effect or concomitant of the disease, whatever it may be.

In further confirmation of the opinions which are now expressed, it may be observed that there is a manifest resemblance between the softening of the spinal chord, which follows mechanical injury, and that softening of the brain and spinal chord which takes place from internal causes, and which was first particularly described by M. Rostan, under the name of *Rammollissement du cerveau.* M. Andral properly rejects the notion that this change is the mere result of inflammation, and every practical pathologist must have had ample opportunities of determining the justice of the argument which he uses, that "We often meet with cases (of *rammollissement*) where there is no appearance of sanguineous congestion, nor of purulent effusion, nor of any morbid secretion; a simple diminution of consistence being all that is to be seen." *

* A treatise on Pathological Anatomy by G. Andral, translated by Dr. Townsend and Dr. West, Vol. II. page 748. 1831.

Although the softening of the spinal chord is not the consequence of inflammation, we must not overlook the circumstance, that inflammation of the investing membranes sometimes exists in combination with it, or that such inflammation may take place where the chord is little or not at all affected in this manner. Inflammation however is to be regarded as one of the secondary effects of the injury, and the consideration of it belongs more properly to another part of the present investigation.

SECTION II.

The peculiar symptoms, which arise as an immediate consequence of injury of the spine, may be referred 1st, to concussion of the spinal chord; 2dly, to laceration or division of its substance; 3dly, to pressure made on it either by displacement of bone or extravasated blood. Afterwards, inflammation of the membrane of the chord may take place, and other organs may be secondarily affected, giving rise to another order of symptoms, which did not exist in the first instance.

Taking a general view of the symptoms, we may observe that they vary; 1st, according to the part of the spinal chord on which the injury has been inflicted: 2dly, according to the kind and degree of injury which the chord has sustained; 3dly, accordingly, as from accidental circumstances, that is from circumstances of which we cannot take cognizance, the life of the patient is prolonged for a shorter or longer period, or ultimately preserved.

Such is the diversity of the symptoms which we meet with in practice, that it would be vain to attempt to give a single connected history of them, which would be applicable to all, or even the majority of the cases: and, on the other hand, a needless repetition in many respects would be the result, if we were to endeavour to distribute the cases under different heads, accordingly as the symptoms arise from different degrees and kinds of injury, or from injuries occurring in different situations. The best consideration which I have been able to give the subject, leads me to believe that the following method of analysis will (on this occasion) be less liable to objection than any other. I propose, in the first instance, to give an account of the several symptoms, which are the consequence of injuries of the spinal chord, in succession, endeavouring to point out (as far as it is in my power to do so) under what circumstances each of them presents itself; and afterwards to offer some general observations, with a view to connect the whole together, and complete the history, which might otherwise be deficient. I hope thus to be enabled to avoid the omission of any facts which are really important, without sacrificing that brevity and conciseness, which it is so important to preserve in all scientific investigations.

Symptoms of Injuries of the Spinal Chord.

Paralysis of the voluntary Muscles.—The most obvious effect of a severe injury of the spinal chord, is a paralytic state of the voluntary muscles below the seat of the injury.

If the spinal chord be divided through its whole substance, or extensively lacerated, or subjected to any considerable degree of pressure, the paralysis is immediate and complete. If the injury be partial, certain muscles may be paralysed, while others retain their power of voluntary motion.

Concussion of the spinal chord often produces complete paralysis also; but more frequently the paralysis arising from it is partial. One limb may be paralytic and another not so; or in the same limb certain muscles may be thus affected, while others are still obedient to the will. In some cases the patient has the power of using his limbs while he is in the horizontal posture, yet he is unable to stand erect. Or the degree of paralysis may vary at different periods. Thus it may be complete at first; then, after three or four days, the power of motion may be in some degree restored; then it may be lost again. Sometimes, although the paralysis is complete, or nearly complete, in the first instance, so speedy a recovery takes place, that the patient is able to walk in the course of three or four weeks, or even sooner; or the converse of this may happen, so that, although there is no more than a weakness of the muscles immediately after the

accident, complete paralysis may take place, sometimes gradually, at other times almost suddenly, after the lapse of several weeks.

Paralysis of the lower limbs is more common than that of the upper. In some cases, in which the injury has affected the spinal chord in the lower part of the neck, the lower limbs are rendered paralytic, while there is either no paralysis, or a less degree of paralysis in the upper limbs. The reason of this is sufficiently obvious to any one who considers what are the origins of the nerves which form the axillary plexus, some of them being probably above the part which is injured: but the circumstance is still remarkable in this respect; that it is contrary to what happens when the functions of the spinal chord are interrupted in consequence of caries of the cervical vertebræ. In these last mentioned cases the paralysis is often complete in the upper limbs for many weeks, or even for months, before it extends to the lower. I have met with only a single case, in which, after an injury of the cervical portion of the spine, there was almost complete paralysis of the muscles of the upper extremities, and none whatever of those of the lower.

A case is recorded by Mr. Stafford, in which there was paralysis of both the upper and the lower limbs, consequent on an injury of the loins, with fracture and displacement of the lumbar vertebræ; and another case fell under my own observation, in which paralysis of the upper limbs followed a contusion of the middle dorsal vertebræ. I conclude that such cases are no more than apparent exceptions to the

general rule, of the paralysis being confined to the parts which are below the injured portion of the spinal chord. It is easy to suppose that the bones may be fractured or displaced in the loins or back, or that blood may be extravasated within the theca vertebralis in one or the other of these situations, while another part of the spinal chord, as high as the origin of the nerves which form the axillary plexus, suffers from the effects of concussion.

Paralysis, after an injury of the spine, is always a dangerous symptom; but many persons thus affected recover nevertheless. For example: a gentleman was thrown from his horse, and received a severe blow on his back. Five weeks afterwards he became paralytic in his lower limbs; but at the expiration of fifteen or sixteen weeks more, he began to recover the use of them, and he was able to walk with the assistance of a stick, when I was consulted about a year afterwards. I have known many cases very nearly resembling this in all essential circumstances. A patient in St. George's hospital, whose lower limbs were paralytic after a severe blow on his spine, regained the use of them in the course of three or four weeks. I shall have occasion to revert to this subject hereafter: in the mean time I may observe, that it is easy to understand that, where paralysis is produced by the pressure of extravasated blood, it may be relieved by the absorption of the coagulum; or that the injury inflicted by concussion on the structure of the spinal chord, may be gradually repaired.

A case is related, by Morgagni, of a young man

who was wounded by a dagger in the neck, and immediately became paralytic in all the parts below the injury. Nevertheless, in less than six weeks he began to re-acquire the use of his muscles, and he was able to walk slowly and cautiously at the end of four months. The records of surgery contain histories which are still more remarkable, in which the spinal chord is said to have been completely divided, without the production of paralysis either at the time or afterwards. Such histories, however, are rare*, and until they are confirmed by further observations, it must remain as a question, whether it be more probable that there should have been so remarkable a deviation from the ordinary course of events, or that the state of the spinal chord in those cases should have been carelessly or insufficiently examined. Undoubtedly our judgment respecting them is not assisted by the analogy of those other cases, which have been described by Magendie, Velpeau, and others, in which the circumstance of a portion of the spinal chord having been reduced to an apparently semi-fluid state without consequent paralysis, may be explained by supposing that there were nevertheless sufficient remains of the medullary fibres to answer the purpose of transmitting the nervous influence.

Muscular Spasms.—A gentleman, in October 1827, was thrown from his horse, which afterwards

* I refer especially to two cases quoted by Velpeau from the Mémoires de l'Academie des Sciences and Desault's Journal.

rolled over him. His head was not struck, and the principal injury seemed to have fallen on the lower part of the spine. Soon after the fall, and while he was yet lying on the ground, his thighs were raised spasmodically towards the trunk, and this was followed by an involuntary tremulous motion of the lower limbs. Afterwards the lower limbs became paralytic, and continued in that state for a period of two months. At the end of that time he began to recover, and when I was consulted, about a year after the accident, he was able to walk without even the assistance of a stick.

In the observations on injuries of the brain which I formerly communicated to this Society*, I mentioned some circumstances which seem to show that the convulsions which occasionally occur at an early period after a severe blow on the head, are the consequence of a slight extravasation of blood, which is sufficient to operate as a cause of irritation, without actually destroying the functions of the brain. Whether the convulsions which took place in this instance had a similar origin, or arose from that disorganization of the spinal chord which is the most usual cause of paralysis after concussion, must be left to future observations to determine. The same symptoms sometimes occur at a later period. For example: a man forty-five years of age, in January 1825, fell from a scaffold, and received a blow on his back. All the parts below the epigastrium became immediately paralysed. At the end of nine days it was

* Medico-Chirurgical Transactions, Vol. XIV., p. 370.

observed, for the first time, that a slight involuntary action of the muscles of the thighs was induced when pressure was made accidentally on these parts. Afterwards severe cramps and painful convulsions took place, whenever pressure was made on any part of the body, or even by lifting up the bed-clothes. At last they were almost constant, so as continually to awaken him from his sleep. When he died, nine weeks after the accident, it was ascertained that there had been a fracture of the fourth dorsal vertebra, with such a degree of displacement as to produce a slight degree of pressure on the spinal chord. There was an abscess, containing from four to six ounces of pus, communicating with the fracture, and extending into the posterior mediastinum. The membranes of the spinal chord, and the spinal chord itself, presented a natural appearance externally, but on the latter being divided longitudinally, the central part of it was found to be in a softened state, so that on being macerated for a short time in water, it almost completely disappeared.

A boy was admitted into the Hospital, in September, 1827, with a fracture and considerable displacement of the third and fourth lumbar vertebræ, so as to cause a manifest alteration in the figure of the spine. He was paralytic in his lower limbs. An attempt was made to restore the displaced vertebræ to their natural position, and was attended with some, but not complete, success. At the end of a month he became affected with slight involuntary motions of the lower limbs, and at the same time he began to

recover the power of moving them voluntarily. Early in the following January he quitted the hospital, and I have had no opportunity of seeing him or hearing of him since.

In each of the two last mentioned cases there was some degree of pressure on the spinal chord; and I am the more inclined to believe that this was the cause of the spasmodic affection of the muscles, as I have not met with any case in which it was proved by dissection, that this symptom existed in combination with disorganization of the chord, and independently of pressure on it.

Affections of the Nerves of Sensation.—If the spinal chord be lacerated, or subjected to any considerable degree of pressure, the sensibility of the parts below the seat of the injury is totally destroyed. If the injury be in the situation of the sixth or seventh cervical vertebra, the destruction of sensibility is frequently partial in the upper extremities, while it is complete in the trunk and lower extremities; but if it correspond with the two vertebræ immediately above these, the patient, during the short remaining period of his life, presents the extraordinary phænomenon of a living head, with its sensibility and muscular powers unimpaired, attached to a trunk and extremities of the existence of which he is totally unconscious.

In cases of concussion of the spinal chord, there are the same varieties with respect to the destruction of sensibility, as there are with respect to that of the power of voluntary motion. Sometimes it is every-

where complete; at other times it is complete in one part and not in another, or the sensations may be dull in every part of the body, although not totally destroyed. Sometimes the skin appears to be insensible, the patient being nevertheless conscious of pressure made on the more deeply-seated parts.

Not unfrequently, unusual sensations are referred to parts, the nerves of which are actually incapable of conveying to the sensorium the impressions made by mechanical pressure, or the application of heat. Sometimes the patient complains that he feels as if he had been everywhere severely bruised; or he has a sense of burning, or of tightness and constriction. In many instances, the destruction of sensibility is incomplete at first, but becomes complete afterwards, as the process of softening makes progress in the injured portion of the spinal chord. Where recovery takes place, the restoration of sensibility usually precedes that of the power of voluntary motion; so that the patient may be quite sensible of external impressions, while he is still incapable of employing his muscles for any useful purpose. The last observations apply equally to all cases, whether the spinal chord has suffered from concussion, or from the pressure of displaced vertebræ.

Affection of the Respiration.—It is well known, that if the spinal chord be divided or lacerated above the origin of the phrenic nerves, that is, above the situation of the third cervical vertebra, immediate death is the consequence. Under these circumstances the nervous influence is no longer transmitted either

to the diaphragm or to the other muscles of respiration, and the animal perishes in the same manner as from strangulation. If respiration be performed artificially, by inflating the lungs, the action of the heart may be maintained, so as to cause life to be prolonged for several hours.

Pressure made on the superior portion of the spinal chord, in consequence of dislocation or fracture, is attended with a similar result. A case of sudden death from dislocation of the second vertebra is recorded by Petit, and other similar cases are described by Sir Charles Bell and Mr. Stafford. The latter author mentions two cases of death taking place immediately, from fracture of the second and third cervical vertebræ. I attended a young gentleman who laboured under symptoms of caries of the superior cervical vertebræ, and who, after having eaten a hearty dinner, suddenly expired while altering his position in bed. The body was not examined, but there was good reason to believe that the spinal chord was compressed in consequence of a dislocation of the odontoid process of the second vertebra.

Dislocations of the first and second vertebræ do not, however, prove fatal in this manner in every instance. A most remarkable example of this fact has lately been communicated to the Society by Mr. Phillips. In this case, the dislocation was the result of accidental violence. A child, four or five years of age, was admitted into St. George's hospital, labouring under well marked symptoms of caries of the cervical vertebræ. The function of respiration was unimpaired.

Soon after her admission other symptoms supervened, similar to those which arise from hydrocephalus, and she died as if from pressure on the brain. On examining the body, the ventricles of the brain were found to be much distended with fluid. The transverse ligament of the second cervical vertebra had given way, and the odontoid process formed a considerable projection into the spinal canal. The dura mater however was entire, and prevented the dislocation being so complete as it would have been otherwise. The pressure on the spinal chord was not sufficient to destroy its functions, although it might well be supposed to have operated as a cause of irritation, so as to produce the effusion into the ventricles of the brain. Another patient, a lad about sixteen years of age, who had been admitted into St. George's hospital, labouring under a caries of the cervical vertebræ, died under similar circumstances.

When the spinal chord is seriously injured in the lower part of the neck, (that is below the origin of the phrenic nerves,) or in the upper part of the back, there is nothing to interfere with the due action of the diaphragm, while the intercostal muscles, as well as the muscles of expiration, are rendered paralytic. The patient therefore breathes by the diaphragm only. The ribs are motionless, and the air is expelled from the lungs, not by the contraction of the abdominal muscles, but simply by the elasticity of the abdominal parietes, and the pressure of the abdominal viscera operating on the lower surface of the diaphragm, where that muscle is relaxed. It may be presumed

that under such circumstances expiration is never so complete as where it is the result of muscular action. At all events, we may observe that the patient is incapable of expectorating mucus if it be collected in the trachea: that, if he coughs, the cough is peculiar, being effected by a forcible inspiration, followed by a sudden relaxation of the diaphragm; and that if he be placed in the sitting posture, so that the pressure of the abdominal viscera is removed from the diaphragm, he breathes with much greater difficulty than when he is lying down. All these are to be regarded as very formidable symptoms. Such imperfect respiration seems to be insufficient for the maintenance of life: the patient seldom survives so long as the sixth day, and he more frequently dies in less than forty-eight hours after the occurrence of the accident. Recoveries under these circumstances are very rare.

Injuries of the spinal chord in the lower part of the neck are not, however, necessarily followed by these results. The pressure on the spinal chord may be so small, or the disorganization of it from concussion may be so trifling, that the muscles of respiration are not, at any period, affected by it: or they may not be so in the first instance, and yet become affected afterwards. In one case which fell under my observation, and in which there was a fracture of the seventh cervical vertebra, followed by a softening and dissolution of the spinal chord, the difficulty of respiration did not take place until the twelfth day; but death occurred in less than three days afterwards.

In proportion as the injury affects the spinal chord lower down in the back, so the respiratory function is in a less degree impaired. In a case of fracture of the sixth dorsal vertebra, I observed (what indeed we might well expect to happen) that although inspiration was well enough performed, the abdominal muscles did not act in expiration. Wherever the injury is situated, a disposition to cough, with a copious expectoration, is likely to occur some time after the accident. In one case, in which there was a fracture of the eleventh dorsal vertebra, with softening of the spinal chord in the same situation, these symptoms began as early as the third day; and such was the disposition to cough, that it was induced by any slight change of position. Nevertheless this patient survived until the end of the fifth week.

Priapism.—This is a very common symptom of injury of the spinal chord, and it is remarkable that, although under ordinary circumstances the erection of the penis is the result of an impression communicated from the sensorium, I have never known it to occur, in these cases, except in combination with paralysis. Priapism may take place whether the patient suffers from the effects of simple concussion of the spinal chord, or from those of pressure. It seems to be connected with injuries of the upper, rather than with those of the lower portion of the chord: at least, I am not aware that I have met with it where the seat of the injury has been below the sixth dorsal vertebra. It is for the most part an early symptom, shewing itself in the course of the second

or third day, and it seldom continues after the first fortnight. It occurs even where the sensibility of the parts is totally destroyed, and may be induced by the mechanical irritation caused by the introduction of the catheter, where the patient is entirely unconscious of the operation. This circumstance was pointed out to me many years ago by Professor Macartney, of Trinity College, Dublin; and I have had many opportunities of verifying the correctness of the observation.

Affections of the urinary organs.—Paralysis of the lower half of the body is, as might be expected, attended with an inability to void the urine: so that the patient requires the aid of the catheter. In the great majority of cases he is not sensible of any inconvenience; and indeed is totally unconscious of the bladder being distended: but there are exceptions to this rule, and occasionally he suffers as he would from an ordinary retention of urine, but in a less degree. The incapability of voiding the urine is usually an early symptom, and in fatal cases it continues to the last. When a complete or partial recovery takes place, the power of emptying the bladder is restored sooner than that of using the muscles of the lower limbs. In cases in which the catheter is not employed, the urine flows involuntarily, as in most other cases of over-distended bladder. At other times there is a constant dribbling of urine, although the bladder is in a contracted state, so that on the introduction of the catheter no urine flows.

None of the consequences of injuries of the spinal chord are more remarkable than the changes which are produced in the secretions of the kidneys and bladder. My attention was first called to this subject as long ago as the year 1807; and my subsequent experience has enabled me to make the following observations on the subject.

The first effect of a severe injury of the spinal chord is not unfrequently to occasion a marked diminution in the quantity of urine secreted. This is most observable where the injury is in the lower part of the neck, and where, in consequence, the function of respiration is very much impaired. Thus, in a patient in St. George's Hospital, in whom there was a forcible separation of the fifth and sixth cervical vertebræ, complicated with fracture and depression of bone, and laceration of the spinal chord, four ounces of urine were drawn off by the catheter at the end of twenty-four hours after the occurrence of the accident, and when he died at the end of twenty-six hours more, the same quantity was found in the bladder, none having been voided in the intermediate time. The same thing, however, may occur when the injury is in the lower part of the spine. For example: a gentleman received a blow on the loins, which occasioned, in the first instance, a partial paralysis of the muscles of the lower extremities. He never experienced any difficulty in voiding the urine, but the secretion was almost entirely, if not entirely, suspended during the first twenty-four hours. I did not see

this patient at the time, but I cannot doubt the accuracy of the report which he made when I was consulted some time afterwards.

In some cases, the urine which is first secreted after the occurrence of the accident, although of an acid quality, and free from mucus, has a peculiarly offensive and disgusting odour. In other cases the urine is highly acid, having an opaque yellow appearance, and it deposits a yellow amorphous sediment. In one case this colouring matter was in such abundance that it was found after death to have imparted a yellow tint to the mucous membrane of the bladder, which at the same time bore no marks of inflammation, even exhibiting less appearance of vascularity than under ordinary circumstances.

But the most common change produced in the urine by an injury of the spinal chord is the following. It is voided of an ammoniacal odour, and turbid; when allowed to cool and remain at rest, it deposits a large quantity of adhesive mucus, and when tested with reddened litmus or turmeric paper, it is found to be highly alkaline. After some time a quantity of white matter (phosphate of lime) may be detected in the mucus, and it is tinged with blood. At a still later period a considerable quantity of coagulum of blood is blended with the mucus and urine. These appearances very commonly shew themselves as early as the second or third day after the occurrence of the accident; sometimes not before the end of a week, or even eight or nine days. I have not observed that injury of one part of the spine is more

liable to produce them than injury of another. There is a great variety as to the period of their duration. In fatal cases they sometimes continue to the last, even though the patient should survive for several weeks, or even months; at other times they continue for two or three weeks, then subside, and the urine remains transparent, and of an acid quality afterwards. In other cases the quality of the urine varies almost from day to day, without any manifest reason for the change. It may be alkaline, depositing adhesive mucus; then clear and acid; then alkaline again; and these alterations may take place several times in the progress of the same case.

It is well known to pathologists that such adhesive mucus as is here described is never a constituent part of the urine as it is secreted by the kidneys, but that it is furnished by the mucous membrane of the bladder and ureters, especially of the former, when in a state of inflammation. The effect therefore of an injury of the spine is, in many instances, to occasion inflammation of the mucous membrane lining the urinary organs; and the consequences of such inflammation, where the urine has continued alkaline and loaded with mucus up to the time of the patient's death, are very manifest on dissection. The mucous membranes of the bladder, ureters, pelves, and infundibula of the kidneys is highly vascular; and in some cases the bladder is lined with phosphate of lime, which the mucus has deposited on its surface. Occasionally spots of extravasated blood are found in the glandular substance of the kidneys, and loose masses

of coagulum in the pelves of the kidneys and in the bladder.

An interesting question here presents itself, whether the inflammation of the mucous membrane of the bladder be a primary or a secondary disease? Whether the injury of the spinal chord operates directly on the mucous membrane, or whether its first effect is to alter the quality of the urine, as it is formed by the kidneys, the mucous membrane becoming affected afterwards, in consequence of the irritation excited in it by the contact of an unhealthy and stimulating secretion? These points remain to be determined by future observations.

Affections of the digestive organs.—In the first instance whatever be the seat of the injury in the spinal chord, the bowels are torpid, so that they cannot be made to act except under the influence of the most powerful purgatives. Then the abdomen becomes tympanitic; and in fatal cases, however protracted, these symptoms generally continue in a greater or less degree to the last.

The same state of the nervous system which produces costiveness, occasions incontinence of the fæces which have already reached the rectum, so that the evacuations take place involuntarily, without the consciousness of the patient. In many cases in which the injury is in the cervical portion of the spinal chord, and death takes place in the course of two or three days, there is a disposition to vomit. In one case which fell under my observation, there was incessant

vomiting of a large quantity of dark-coloured fluid: in another case, in which the patient died on the fifth day, during the two days which preceded his dissolution there was a perpetual gulping, and ejection of a similar diseased secretion.

In more protracted cases the alvine evacuations are of a black colour; semi-fluid, somewhat resembling tar or treacle in their appearance, and of a peculiar and offensive odour.

It has not been ascertained, as far as I know, what is the nature of the substance on which this dark colour depends. It certainly is not mere extravasated blood. Probably it is furnished by the secreting vessels of the stomach and intestines, and corresponds to the dark-coloured matter which is sometimes vomited at the termination of typhus fever, or to the black sordes which, under the same circumstances, are attached to the gums and teeth. It is only within the last two or three years that my attention has been directed to the subject, and further observations are required for its elucidation.

Alteration of the vital temperature. — M. Chossat has published an account of some experiments on animals, in which he found that the division of the superior portion of the spinal chord produced a remarkable evolution of animal heat, so that it was raised much above the natural standard. I have made experiments similar to those of M. Chossat, and have met with similar results. I have also seen several cases in which an accidental injury

of the spinal chord has produced the same effect. The most remarkable of them was that of a man who was admitted into St. George's hospital, in whom there was a forcible separation of the fifth and sixth cervical vertebræ, attended with an effusion of blood within the *theca vertebralis,* and laceration of the lower part of the cervical portion of the spinal chord. Respiration was performed by the diaphragm only, and, of course, in a very imperfect manner. The patient died at the end of twenty-two hours; and, for some time previously to his death, he breathed at very long intervals, the pulse being weak and the countenance livid. At last there were not more than five or six inspirations in a minute. Nevertheless, when the ball of a thermometer was placed between the scrotum and the thigh, the quicksilver rose to 111° of Fahrenheit's scale. Immediately after death the temperature was examined in the same manner, and found to be still the same.

In the year 1812 I published an account of some experiments made on rabbits, in which it was found that when these animals were stupified by the action of the Woorara poison, although the same quantity of oxygen gas was consumed in respiration as under ordinary circumstances, little or no animal heat was generated. In the case to which I have just referred, the effect was exactly the converse of that which was produced in these experiments; the respiration being so imperfect that the consumption of oxygen must have been very much diminished, yet

the production of animal heat was much greater than under ordinary circumstances.

Gangrene.—One result of an injury of the spinal chord is a diminution of the vital powers of the external parts, so that gangrene takes place, and sloughs are formed, on even the slightest pressure.

This disposition to gangrene is evidently a direct consequence of the injury of the chord, since it occurs equally whether the action of the heart be strong or feeble, and is limited to those parts which are below the seat of the injury.

In many cases in which the injury has affected the cervical portion of the spinal chord, sloughs begin to be formed, not only on the sacrum and nates, but even on the ankles, as early as the second day. In the last-mentioned parts we have the opportunity of watching the gradual formation of the sloughs. There is first a purple appearance of the skin; then a vesication containing a dark-coloured fluid; and this is for the most part immediately followed by the loss of vitality in the subjacent textures. When the injury has affected the dorsal portion of the spinal chord, the sloughs are generally, but not always, confined to those parts on which the pressure is greatest; that is, to the integuments of the nates and sacrum; and the formation of them begins at a later period. It is remarkable that in these last-mentioned cases the separation of the sloughs begins at an unusually early period, fresh sloughs being formed immediately afterwards.

Affection of the Sensorium.—I refer in this place merely to the effect produced on the sensorium immediately after the accident has occurred.

I have seldom observed the sensorium to be materially affected, except where the injury was in the cervical portion of the spinal chord, and here the results are very different in different cases.

Thus, in one patient, in whom there was a fracture of the fifth and sixth cervical vertebræ, with displacement of bone and laceration of the spinal chord, the functions of the sensorium were in no degree disturbed, the patient being perfectly conscious and talking rationally. Another patient, in whom the same part of the chord was bruised and lacerated, became comatose soon after the accident. On some blood being taken from the arm, the coma subsided; but at the end of twelve hours he became again comatose, and continued so until he died, ten hours afterwards. A third patient, in whom there was a fracture of the fourth and fifth cervical vertebræ, with softening of the spinal chord, was at first perfectly conscious and sensible. In less than twenty-four hours he fell into a state approaching to that of complete stupor; then became delirious, and continued so until he died, thirty-six hours after the accident. A fourth patient, in whom there was a small extravasation of blood in the centre of the spinal chord, opposite the fifth and sixth cervical vertebræ, died in less than forty-eight hours, having been sensible and conscious nearly to the last, but the pupils of his eyes being contracted.

Symptoms not included under the foregoing heads.

The first effect which a severe injury of the spinal chord (whatever may be the exact nature and seat of the injury) produces on the circulation, is to lessen the force of the heart's action, and to cause a state of general depression and collapse; the pulse being very feeble, contracted, and sometimes scarcely perceptible. Occasionally a rigor takes place soon after the accident has occurred.

When the injury is in the lower part of the neck, the patient not unfrequently dies before complete re-action is established, the pulse remaining feeble to the last; or it may beat distinctly, but not oftener than fifty or sixty times in a minute. In the majority of cases, however, after the first twenty-four hours, the pulse rises to ninety-six or a hundred in a minute; but still it is feeble and contracted, indicating a state of great general debility rather than the existence of an active inflammatory disease. The appearance of the tongue corresponds to the character of the pulse; and it is not unusual at the end of twenty-four hours to find it dry and parched, covered with a brown fur, which is soon converted into a black crust, resembling what we observe in the last stage of a continued fever.

When the injury is in the lower part of the neck, but not of such a nature as to occasion death within the first three or four days, or where it has affected the dorsal or lumbar portion of the spinal chord,

and the patient does not die at an early period, or ultimately recovers, the pulse usually remains for a considerable time more frequent than natural, varying from ninety to one hundred and twenty beats in a minute, but feeble and contracted, the tongue at the same time becoming more clean and moist than it was in the first instance. If blood be drawn under these circumstances, the coagulum is of a large size and loose texture; often never exhibiting any inflammatory appearances whatever; sometimes having a slight buffy coat on its surface in the first instance, but none afterwards. As far as I have seen, these observations apply to all those cases in which the effect of the injury is to induce that softening of the medullary substance of the spinal chord, which may or may not terminate in its complete dissolution, without exciting inflammation of the membranes in which it is enveloped; and these facts go far towards confirming the opinion which I have already ventured to express, that this change in the organization of the chord is to be regarded as the result of a peculiar process, which may exist independently of inflammatory action.

Inflammation of the membranes of the spinal chord is undoubtedly a much more rare consequence of injuries of the spine, than inflammation of the membranes of the brain is of injuries of the head. In the cases of this kind which have fallen under my observation, the process of softening and dissolution of the spinal chord had gone on simultaneously with the inflammation of the membranes, and there were during life

all those symptoms by which the existence of the former of these affections is indicated in other instances. But superadded to these, there were profuse perspirations, and severe and repeated rigors marking the occurrence of suppuration: there were also spasmodic twitches of the voluntary muscles, but not until it might reasonably be supposed that pus was collected in sufficient quantity to make pressure on the spinal chord. I have already mentioned cases in which pressure arising from other causes produced a similar effect.

Sir Charles Bell has described two cases, in which inflammation and suppuration of the membranes of the spinal chord followed injuries of the spine, unconnected with softening of the chord itself, and producing symptoms a good deal similar to those which are described as taking place where these membranes are inflamed from other accidental causes. In the first of these was a fracture of the eleventh dorsal vertebra. The patient was affected with delirium, attended with a rapid pulse. The most remarkable circumstance was, that there was no loss either of sensation or of the power of voluntary motion. Death, preceded by typhoid symptoms, took place on the fifth day.

In the other case recorded by Sir Charles Bell, the injury was in the lower cervical and first dorsal vertebræ, and the whole of the spinal chord, from this part to the lower part of the loins, was found after death to be bathed in pus. There were no severe or urgent symptoms for the first eight days; then

patient was seized with violent convulsions, followed by fever and delirium. There were no paralytic symptoms until the tenth day, when there was a difficulty in raising one arm, and this was followed by complete paralysis of the lower limbs two days afterwards. Death, preceded by typhoid symptoms, took place nearly three weeks after the occurrence of the accident.

These cases are of great interest, and among those, of which I have preserved notes, I can find none precisely similar to them.

I have met with one case in which inflammation of the membranes of the spinal chord took place under peculiar circumstances, being apparently not a primary but a secondary effect of the injury. A man was admitted into the hospital, in whom there was a fracture of the sixth dorsal vertebra; the consequence of a fall from a high scaffold. He died at the end of six weeks, with softening of the spinal chord in the situation of the fracture for the extent of two inches, and having laboured under the usual symptoms. On the tenth day after he met with the accident, there were vesications containing a dark coloured serum on one foot, and a slough had begun to form on the integuments over the *os sacrum*. The sloughing process rapidly extended, and about a week before he died, a large slough came away, including the greater part of one *glutæus maximus* muscle.

On examining the body after death, besides the softening of the spinal chord already mentioned in the middle of the back, the following appearances were

observed. The sloughing process had extended so as to destroy the soft parts covering the *os sacrum* and the parts in its vicinity, including the ligaments at the posterior part of the pelvis and those of the lumbar vertebræ. The spinal canal was in consequence exposed, and a considerable quantity of pus had been deposited between the vertebræ and the *dura mater*. On the *dura mater* being divided, a layer of coagulated lymph of a yellow colour was found adhering to the inner surface of that membrane, and to the external surface of the arachnoid. The lymph was most abundant in the situation of the *cauda equina*, but traces of it were perceptible as high as the lowest dorsal vertebra. From this part to the middle of the back, in which the spinal chord was in a half-dissolved state, the spinal chord and its membranes bore no marks of disease. Unless it were the existence of profuse perspirations, there were no peculiar symptoms which could reasonably be attributed to the extension of the sloughing, and the effects produced by it on the deep-seated parts within the spinal canal.

In reviewing the various consequences of injuries of the spinal chord, we find nothing more remarkable than the following circumstance: that whether the chord be lacerated or compressed, or has undergone that kind of disorganization which is induced by a severe concussion, there is no material difference in the symptoms which arise, or in the results to which they lead.

There is another circumstance not much less worthy of notice than those which I have just mentioned.

The great majority of the symptoms are the same, whatever part of the spinal chord has suffered from the injury. This observation applies to the state of collapse, which immediately follows the accident; paralysis of the voluntary muscles, loss of sensibility, priapism, the disposition to gangrene, the altered secretions of the kidneys, inflammation of the mucous membrane of the bladder, and consequent deposition of adhesive mucus by the urine, and the derangement of the functions of the digestive organs, as indicated by tympanitis, and the discharge of black and offensive evacuations from the bowels.

There is only one order of symptoms with respect to which a great difference exists accordingly as the seat of the injury is in one or another part of the spinal chord. If the functions of the chord be interrupted above the origin of the phrenic nerves, respiration is immediately suspended, and instantaneous death ensues. If the same thing happens in the lower part of the neck, or in the upper part of the back, respiration is performed by the unassisted action of the diaphragm: if in the middle or lower part of the back, the muscles of inspiration are unaffected, but those of expiration are paralysed. It is only in those cases in which the injury is trifling, or confined to the lowest portion of the spinal chord, that the respiration is altogether unaffected. These facts have been already stated, but they deserve our attention in this place, as they explain why the danger to the patient's life is greater and more imminent in proportion as the injury is nearer to the brain. According to my ex-

perience, where a considerable injury has been inflicted on the spinal chord in the lower part of the neck, or in the neighbouring part of the back, of such a nature as to paralyse all the muscles of respiration, with the exception of the diaphragm, the patient rarely survives to the end of the fourth or fifth day, while in the majority of cases he dies at a still earlier period. The following case (to which I have already had occasion to refer) can scarcely be regarded as forming an exception to this general rule. In the patient to whom I allude, there was a fracture of the seventh cervical vertebra. The respiration was not affected in the first instance. On the twelfth day he suddenly began to breathe with difficulty, and by the diaphragm only: on the following day he died. On dissection it was ascertained that there was some displacement of the fractured bone, but not sufficient to occasion pressure on the spinal chord. An inch and a half of the chord was in a softened state, but the softening process had not proceeded so far towards dissolution, as in many other cases at the same period. I conclude that the chord had, in the first instance, undergone a very trifling degree of disorganization, and that it was only as the effects of the concussion became more completely developed that the difficulty of respiration commenced *.

* In a case under the care of Mr. Green, in St. Thomas's hospital, reported in the Medical Gazette, (Vol. I. page 224,) in which there was a fracture and dislocation of the seventh cervical vertebra, the patient survived until the seventeenth day; but it was stated that the respiration was difficult, performed by

Cases of recovery even after what may be regarded as a severe injury of the spinal chord, are by no means uncommon. If it suffers from the effects of concussion, the recovery may be complete; the period of recovery varying from three weeks to twelve months or more. If the chord be lacerated, or much compressed by displaced bone, he may live, but without recovering from the paralysis. Under these circumstances, life may be prolonged for an indefinite period. A man was admitted into St. George's hospital in January, 1823, who had met with an injury in the preceding August, in consequence of a mass of chalk having fallen upon him while working in a chalk-pit. Mr. Hardwicke, of Epsom, being sent for, found the first lumbar projecting over the last dorsal. With some difficulty he reduced the displaced vertebra to its natural position, the reduction (as I was informed) taking place with a jerk or snap. At the time of his being received into the hospital, he had

the action of the diaphragm, with a trifling action of the intercostal muscles. The respiration became more difficult afterwards, but the exact period at which this change took place is not noticed. In another patient, also under the care of Mr. Green, (Medical Gazette, Vol. VI. page 190,) in whom the third dorsal vertebra was the seat of the injury, there was in the first instance paralysis of the lower limbs, and it is represented that he breathed by the action of the diaphragm only: this last observation however was evidently erroneous, as he *breathed easily*, and as there was a slight motion of the ribs, attributed by the reporter to the expansion of the lungs. *Respiration by the diaphragm only is always difficult*, and the expansion of the lungs following the descent of the diaphragm is quite insufficient to account for the motion of the ribs. This patient recovered.

some power of using his lower limbs while in bed, but he could neither walk nor stand, and he was unable to empty his bladder without the aid of the catheter. He remained nearly in the same state when he quitted the hospital, two months afterwards. When I last heard of him, after the lapse of two or three years more, he was still alive, but no material alteration had taken place in his symptoms.

SECTION III.

Treatment of Injuries of the Spine.

In making this communication to the Society, my principal object has been to analyse and arrange the pathological changes, and the symptoms to which injuries of the spine give rise. But I am unwilling to leave the enquiry so incomplete as it would be if I were to omit altogether the consideration of the surgical treatment which these accidents require, and I shall therefore in conclusion offer some brief observations in illustration of the last mentioned subject.

When a bone is dislocated, or when it is fractured and displaced, the first question which presents itself to the surgeon is, whether it ought to be restored to its natural situation? and if so, how is that to be accomplished?

Dislocations and fractures, with displacement of the cervical vertebræ, are not always immediately fatal; and I cannot say that no circumstances can exist which would justify the attempt to effect reduction

in such cases: but it is evident, that if the attempt be made at all, it must be with the greatest caution, and Boyer describes a case in which a child died under it.

There can however be no doubt, that when the injury is in the lower part of the spine, the attempt to effect reduction may be not only made with impunity, but that it may be successful. In proof of this assertion, I may refer to a case which I have already described, which occurred in the practice of Mr. Hardwicke, of Epsom; the patient being afterwards admitted into St. George's hospital, labouring under paralysis of the lower limbs. In another case, to which also some allusion has been already made, and which occurred under my care in St. George's hospital, there was a fracture with great displacement of the third and fourth lumbar vertebræ. When the patient had recovered from the state of collapse which had followed the first shock of the accident, I endeavoured, by fixing the thorax and cautiously extending the pelvis, to restore the vertebræ to their proper place. The attempt was in some degree successful, and no ill effects of any kind resulted from it.

Some discussion has of late years been excited, in consequence of a proposal, which I believe originated with the late Mr. Henry Cline, to apply the trephine in cases of fracture of the spine attended with depression of the bony ring of the vertebræ, with a view to the removal of the depression.

The question respecting such an operation seems to me to lie in a very small compass. If the whole

or nearly the whole of a vertebra be driven forwards, the depression of the posterior part of it will of course occasion a diminution of the size of the spinal canal; but the removal of any portion of the vertebra which is accessible to an operation, will be of little avail, as the irregularity in the anterior part of the canal, made by the displacement of the body of the vertebra, must be the same after, as it was before, the operation.

If there be simply a fracture on each side of the spinous process, with a depression of the loose or intermediate portion of bone, of course there must be a corresponding diminution of the size of the vertebral canal; but as that canal is much larger than the spinal chord, which it contains, it does not follow that the spinal chord is really compressed, or that any material diminution of the symptoms would follow the elevation of the depression.

But let it be supposed that the spinal chord is really suffering from pressure: it has been already shewn, that a much less degree of violence than that which is necessary to occasion a fracture of the spine, may produce concussion, softening, and ultimately dissolution of the spinal chord, with a train of symptoms much worse than those which arise from simple pressure. Now no operation can be of the smallest advantage in this respect: but, on the contrary, if it be necessary to apply the saw in the performance of it, the jar and disturbance of the parts which this must occasion is even likely to aggravate the mischief.

If these views be correct, it is evident that the cases, in which there are any reasonable grounds for the performance of the operation, must be of very rare occurrence, and that even under the most auspicious circumstances it must be doubtful whether it may not be productive of harm rather than of good to the patient.

Nor, as far as I am acquainted with the results, do the experiments, which have been hitherto made on the subject, lead to any more satisfactory conclusion. I am not aware that in any of the cases, in which it has been hitherto performed, the operation has proved the means of preserving the patient's life, or even of relieving any of the more important symptoms.

In the treatment of mechanical injuries generally, nothing is of so much importance as the maintenance of the injured parts in a state of complete repose, and it is not less indispensable for us to observe this rule in cases of injury of the spine, than it is on other occasions. With this view we lay the patient in a supine and horizontal posture on a mattress. We can attain what is wanted in this respect by no other means: otherwise as good a reason might be offered for placing him on his face, with his spine uppermost, as for placing the head on a high pillow in a case of apoplexy or concussion of the brain.

I have shewn that, in some cases, an injury of the spine is followed by inflammation of the membranes of the spinal chord, and there can be no doubt that it is then necessary to take blood from the arm,

and even to repeat the blood-letting several times. The state of the pulse forms a sufficient indication to the practical surgeon of the necessity of such active treatment, and the appearances of the blood after it is drawn will assist his judgment in determining to what extent it should be carried. It is, however, if my experience has not much misled me, a great mistake to suppose that blood-letting is always proper. In the majority of cases the state of the pulse is such as actually to contra-indicate the abstraction of blood, and as I have already stated, the blood when drawn does not in general present those appearances which are supposed to mark the existence of inflammation. I have no reason to believe that blood-letting arrests the process of softening and dissolution of the spinal chord, and indeed I have usually found that the symptoms which mark the existence of these changes make a more rapid progress, in proportion as a larger quantity of blood is taken away. The weak and contracted pulse, the disposition to gangrene, the alkaline quality of the urine, the black and offensive alvine evacuations, and the brown or black fur on the surface of the tongue, would, under other circumstances, be regarded as proofs of depression and debility, indicating the use of stimulants rather than of what are called antiphlogistic remedies. From all that I have seen, I cannot doubt that much harm has arisen from the indiscriminate application of the practice, which is usually proper and necessary after injuries of the head, to cases of injury of the spine.

I have stated that a torpid state of the bowels is almost a constant result of these accidents, such as cannot be overcome except by the exhibition of powerful purgatives. I have generally found that the combination of ammonia facilitates their action, and that it will often enable them to produce the desired effect, when they would not have produced it otherwise. Attention to this part of the treatment is especially required when the evacuations are black and offensive. The retention of the unhealthy secretions, on which these qualities depend, cannot be otherwise than injurious to the general system.

The use of the catheter is necessary from the beginning, in all cases in which the lower part of the body is paralytic. It does not, however, prevent the urine becoming alkaline, nor the secretion of adhesive mucus from the lining membrane of the bladder. When these changes have taken place, the bladder should be emptied several times daily; and it may be advisable in some instances to inject tepid water into it, so as to prevent any portion of the mucus being retained in its cavity. The mucus is itself the product of inflammation; but, on this, as on other occasions, it forms an irritating application to the parts with which it comes in contact, and thus tends to aggravate and increase the inflammation, on which the formation of it originated.

In the treatment of those cases of injury of the spinal chord, in which gangrene takes place from pressure, we labour under greater difficulties than

in ordinary cases of gangrene, owing to the very slight degree of pressure which is sufficient to produce these frightful consequences. All that it lies in our power to do is to cause the pressure to be diffused over as large a surface as possible, and to endeavour to increase the force of the heart's action by the prudent exhibition of stimulants.

OBSERVATIONS

ON

SOME TUMOURS

OF

THE MOUTH AND JAWS.

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READ JUNE 7TH, 1836.

The attention of the profession has been more particularly directed of late years to the diseases of the jaws, in consequence of the novel and bold operations which have been resorted to by some surgeons for their removal and permanent eradication. Many of these affections were formerly looked upon as perfectly irremediable by any means, and indeed I can recall to my recollection several cases which I witnessed when I first embarked in the profession, which were given up as incurable after severe though ineffectual attempts to control their growth by escharotics and actual cautery, which would now be fearlessly and successfully attacked, and effectually removed by operative procedure. Many of the diseases of this region are still, however, in some stages, from their intrinsic nature and disposition, beyond the reach of the science and art of surgery, and one principal ob-

ject which I have in view in the following paper is to point out what I consider to be the characters by which those tumours which may with safety and propriety be interfered with, may be discriminated from those affections, on the other hand, which no conscientious or well disposed surgeon ought or would think of touching with a knife. I hold it to be a maxim never to be forgotten or departed from, that no operation, far less one hazardous to life, should be entered upon, unless there be a fair prospect and strong probability of ultimate success. No man is entitled to put the life of another in jeopardy unless, after all the suffering and risk attendant upon this last resource, success is likely to crown his efforts.—In all diseases, wherever situated, of a malignant tendency, when from their extent and duration there is a certainty, or even a probability of the neighbouring parts being affected, or so disposed as to take on the same action, or where the lymphatic system is contaminated, very little prospect or hope of successful issue can be held out. We are therefore called upon to look to the previous history of such diseases, their origin, progress, and duration,—to the signs of the malady,—and from these to form, so far as we are able, a correct diagnosis.

The mouth is the seat of tumours of very various consistence, structure, and dispositions; presenting themselves in different situations, and proceeding from tissues of different kinds. The parulis and spina ventosa of the jaw, swellings of acute or chronic nature, containing generally a purulent secretion, may be here merely alluded to. The latter often attain an

immense size, and have their origin very frequently in alveolar abscess, in cysts growing from and attached to the apices of the roots of decayed teeth. They cannot be got rid of in some stages without recourse to a somewhat severe operation. Occasionally connected with cysts containing a serous fluid, more or less of solid swelling is found to exist. In one case which came under my notice, and in which the lower jaw was the seat of the disease, the cyst occupied the situation of the last large molar and wisdom tooth, which had apparently been blighted. The cyst was opened and obliterated by setons, but some years afterwards a growth betwixt the lamellæ of the bone, which was at first of inconsiderable bulk and indolent, began to enlarge and ultimately attained such a size and presented such an appearance as to render the removal of the bone from near the symphysis to the articulation absolutely necessary. The operation was perfectly successful and the cure permanent.

The epulis, (well described by the late Mr. John Bell, in his "Principles",) a solid growth from, and of the consistence of, the gum, first appearing between the teeth, adhering firmly to the periosteum around their necks, and gradually spreading itself in the same structure, often attains a troublesome and alarming size; the deeper parts become involved, the alveolar processes, the periosteum of the sockets and teeth; these latter are loosened, separated and projected; the section of such tumours often exhibits spiculæ of osseous matter shooting into a dense fibrous structure which adheres to the surface of the bone. Its seat is

generally in front of the mouth and in the lower jaw, but occasionally it is met with in the parts investing the molares. It seems to originate from disease of the teeth, from crowding or irregular distribution of these bodies, from injury accidental or inflicted in ill directed operations for the removal of teeth,—the bruising of the gum, for instance, by the bolster of the old key instrument or pelican. But the disease is occasionally met with where the teeth are sound, have room enough for their development, where no injury has been received, and in fact without any assignable cause. These are not generally "tumores mali moris", though occasionally they do degenerate, contaminate the neighbouring parts, and are liable to be reproduced, and sometimes after some interval from their apparently complete extirpation.

A disease of a more troublesome nature seems however to proceed originally from the sockets of the teeth, from the periosteum of the root. It appears as a soft vascular growth from the apex or side of the fang, (the soft medullary fungus filling up and projecting from the hollow of a decayed tooth seems to have a different origin): this is loosened, the gums separate and become injected and flabby, they swell out and form a tumour investing the teeth, which one after another become displaced, and after being removed, their roots are sometimes found highly injected with blood. Copious sanious discharge is furnished from the soft and fungous mass, which bleeds on the slightest touch; the osseous tissue, comprising the alveolar processes, and even the substance of the

jaws, is changed into a soft lardaceous or brain-like mass. Of this disease in its incipient and advanced stage, there are to be seen specimens in many collections. It is not improbable that many of the more solid and less malignant diseases, involving the upper and lower maxillary bones, have a somewhat similar origin.

The progress of these diseases is various; in some it is rapid, and the growth is soft and unlimited. It soon bursts through the walls and investments of the bone, adhesions are formed to the neighbouring parts, which take on an unhealthy action, a fungous growth of a soft and bad character is thrust out into the mouth, the lymphatics are soon affected, and the case is speedily in a hopeless condition.

In the upper jaw, a most malignant and intractable disease is met with, often traceable to long continued irritation in the alveolar processes or sockets, from the presence of decayed or bad portions of teeth. The disease, it is probable, sometimes commences in the manner already indicated, and spreads to the lining membrane of the maxillary antrum, or it may and must often have its origin in that tissue originally. We find, in fact, though more rarely, the same morbid structure springing out of the frontal and sphenoidal sinuses primarily. This disease is so well known that it would be out of place here to enter into a description of its progress or anatomical characters. Its accession is insidious, the patient has painful sensations in the side of the face, a feeling of distension, there is some increased discharge from the

nostril, and the cavity becomes obstructed. Lodged deeply amongst the bones of the face, it makes its way at first very gradually, drawing into the same action the investing parts, the bone and its exterior covering, the teeth become loosened, the walls of the cavity are protruded and softened, œdematous matting and discoloration of the cheek follows, fungous growths shoot out into the nose, towards the mouth through the thin anterior parietes, or through the palate, presenting a soft, ragged, foul ulcer, (not very appropriately designated cancerous by some writers,) through the tuberous process backwards to the throat, and ultimately towards the eye through the floor of the orbit, extruding this organ, and involving it in a frightful, soft, and sometimes bleeding mass. To this disease the term osteo-sarcoma (not a very good or appropriate one in any instance) has been often applied. The bone is involved secondarily in many cases in the morbid mass, is expanded, softened, and wasted by its blasting influence. It is not a tumour of bone or a conversion of it into flesh, or pulpy matter. The march of this disease is usually exceedingly rapid. Some tumours in this situation, soft and brain-like, and from the first of a bad kind, grow more slowly and have no great tendency to bleed.

Tumours composed of erectile tissue have been found to occupy the cavity of the antrum, and cases are recorded by Gensoul and by Professor Pattison, in which the signs and characters before and after operation confirmed this supposition: these however

seem to be rare in comparison with those of the encephaloid nature.

But the superior maxilla is found now and then to be involved in a tumour of a more simple and manageable nature, commencing in the osseous structure or periosteum. Some rare cases also of extensive deposit, of very hard osseous matter ultimately filling up the cavities and fossæ of these bones, are occasionally met with. The fibrous or fibrinous tumours, as they are more properly denominated by that indefatigable pathologist Mr. Kiernan, are very generally traceable to some external injury, (to which indeed the majority of enlargements of parts and new growths in all situations are to be attributed,) and are of comparatively slow growth. From its more exposed situation, the lower jaw is more frequently found affected with swellings of a simple or fibrous character than the upper, and it may be deduced from what has already been remarked, that the affections of the latter bone are generally of a malignant kind; those of the former more benign. As it has been already remarked, however, simple tumours involving the upper jaw and neighbouring bones, principally the os malæ are occasionally met with, and the lower jaw is not exempt from the attacks of the softer and more troublesome degenerations.

The simple tumour, whether involving the upper or lower jaw, differs in consistence and in form also from those soft, lardaceous or pulpy and brain-like masses, whose appearance and progress I have shortly alluded to. They attain though slowly a great size, they pre-

sent a *globular* or *botryoidal* form, displace the surrounding soft and hard parts, project from the countenance, and deranging the features produce great and frightful deformity. The skin may be thinned and pervaded by enlarged venous branches; it is discoloured, but not incorporated even in an advanced stage with the morbid mass, nor are any of the surrounding tissues contaminated. The projection towards the mouth, often large and passing down by the side of the opposed teeth and jaw, is hard and elastic, and conveys the feeling of brawn interspersed with bony particles; but it is covered by a continuation of the mucous lining of the cavity slightly thickened and altered, furnishing an inconsiderable discharge, and that neither offensive nor of a bad quality. This growth in the mouth presents indentations made by the teeth with which it comes in contact. The hard palate when the upper jaw is involved, is generally covered by a thick layer of tumour, which projects over, and lies in contact with, but is not adherent to it, nor to the gums supporting the teeth of the opposite side. It obscures the view of the velum and fauces, and by impeding respiration makes the patient very uncomfortable, renders his supply of nourishment incomplete, and even puts his life in jeopardy. The tumour of the lower jaw again, by the displacement of the tongue and interruption to the performance of its functions, is equally inconvenient and dangerous. In the records of surgery, I can find very few such tumours described as affecting the superior maxilla, and my enquiries respecting the cases which have

been subjected to operation, which are as yet unpublished, would lead me to conclude that the diseases interfered with, have not all been of this benign and tractable nature. In many of these the morbid action has not ceased, the growth has been reproduced, and the patients have not in any way been benefited by the treatment.

I shall not attempt to enumerate those cases in which soft growths have been imperfectly scooped out from the antrum maxillare, and then attacked with caustics or hot irons, or those again of a harder consistence which have been plucked out by main force and piecemeal, whether got at by the division of the cheek or not. I have seen many such operations practised, and one, in which I myself operated unsuccessfully many years ago, is reported in the Edinburgh Medical and Surgical Journal. The result of such operations was, with few exceptions, most unsatisfactory.

I find that fifteen cases have been laid before the profession and the public, in which it appears that the whole or greater part of the superior maxillary bone has been extirpated, (in one of them, by the way, incisions were made for this purpose on two separate occasions, and but little of the disease removed.) Eleven of these patients died, either from the immediate effects of the operation or from a return of the disease. The operators were Messrs. Lizars*,

* Medical Gazette, Vol. V. p. 92; Lancet, Vol. II. 1829, 30, p. 54.

Gensoul *, Syme †, Robert ‡, Scott §, Earle ||, Guthrie ¶, and Hetting **. In two of the four who are said to have been cured, the tumour is admitted to have been soft, and probably of a bad kind. In fact, out of the fifteen, one case only appears to have been, at the period when interfered with, very favourable for the operation; the first, viz., recorded by Gensoul. That tumour he describes as globular, of firm consistence, fibro-cartilaginous, and of a homogeneous structure. M. Gensoul's second case also seems to have terminated favourably, and is one of those already alluded to as composed of erectile tissue.

In the course of the last fifteen years, I have been consulted regarding a great many tumours involving the upper and under jaws of various consistence and extent, a great many of them, as might be expected, of a very bad kind. Some had commenced in the soft parts, in the skin or glands, as the encephaloid or carcinomatous degenerations, and had in their ravages taken in the osseous tissue. Others commencing in

* Lettre Chirurgicale sur quelques maladies graves du sinus maxillaire. Paris, 1833.

† Edinburgh Medical and Surgical Journal, 1829, 34, 35; and Lancet, 1834, 35.

‡ Lancet, Vol. I. 1834, 35, p. 261.

§ Lancet, Vol. I. 1830, 31, p. 319; Lancet, Vol. I. 1831, 32, p. 604.

|| Medical Gazette, Vol. IX., p. 374 and 454.

¶ Medical Gazette.

** Provincial Medico-Chirurgical Transactions.

the latter tissue were decidedly malignant, and far advanced in their growth; these I had not the boldness, I might say fool-hardiness, to meddle with. Some of them were afterwards made the subject of operative procedure, but the results did not tend much to enhance the reputation of the operators, or to advance the interests of the profession.

I have been fortunate enough, however, in the course of my practice to meet with several cases of the simple or fibro-cartilaginous tumour; these have been operated upon by me successfully, and with most satisfactory ultimate results. I propose now to lay before the Society an abridged account of those cases, accompanied with representations of some of the tumours previous to, and after removal. It may not be out of place here to give also a short history and comparative view of the different modes of operating which have been pursued, and to indicate those which appear to be most advisable in the various affections under consideration.

The tumours of the gums cannot be satisfactorily or permanently removed unless the teeth which they embrace are extracted, whether these be in a sound state or not. Indeed some slight and more simple swellings will subside on the removal of the remains of diseased teeth, which have acted as the exciting causes of mischief. There can be no doubt as to the propriety and absolute necessity of taking away all source of irritation as a preliminary step to operations of any kind in this cavity, whether the disease has arisen in the mucous surface, in the substance of

the lips or tongue, in the glands, gums, or osseous structure, or in the cavities contained therein.

An incision should be made with a strong pointed knife, so as to surround the base of the tumour, and wide of the morbid structure; when the alveolar processes are involved, these must be cut away with cross cutting forceps, and if to any depth, perpendicular sections should be previously made on each side of the mass with a fine saw. When there is reason to dread that the structure is at all of a bad kind, when unsuccessful operations have been previously practised, besides the free excision, it will be advisable, after the oozing of blood has ceased, to apply either the actual or some potential cautery to the exposed surface. In many cases this is not demanded, as a permanent cure is often found to follow the clean extirpation. The incisions either in the upper or lower jaw, must necessarily be made so free as to take in the whole morbid mass. I have found it necessary to remove extensively the floor of the antrum and to cut down the alveolar ridge of the lower jaw, leaving merely a thin line of the base, in order to attain this end in some cases. This proceeding is preferable, when it can be accomplished to the cutting across and removing the whole thickness of the bone; deformity is thus in a great degree guarded against, and the corresponding teeth of the upper and lower jaw meet. But even after the removal of great portions of this bone, as by disarticulation, and by some attention on the part of the patient, (he being provided with, and being directed to wear for some time

and during the night, caps fitted to the teeth of the sound side above and below, and soldered together,) the remaining half of the bone, during the cicatrization within the mouth, is prevented from being drawn awry, and much annoyance is thus averted.

The malignant tumours, those of soft consistence, which lose themselves insensibly in the neighbouring tissues, if interfered with at all must be attacked by some very effectual operative procedure, and in their very earliest stage. The fore part of the antrum so affected, as already noticed, has been exposed and opened in very many cases by incisions of the cheek and the morbid growth been taken out, and this has been followed up by the application of strong escharotics or of cauteries. The result of such operations has seldom been at all satisfactory, as can be readily understood. The difficulty, even in favourable cases, of taking away after this fashion the whole of the contaminated parts is very great, and there is reason to fear that very frequently the progress and fatal termination has been, under such circumstances, accelerated. One case is reported as cured by Desault *, by cutting and cauterizing; another, as cured by Sir A. Cooper †; the incision in that case being followed up by repeated applications of strong arsenical solution. Some more solid fibrous polypi, as they have been denominated, have been grappled with and seized by forceps after the cheek has been laid

* Œuvres Chirurgicales, Tome II. p. 165.

† Bell on the Diseases of the Teeth, p. 283.

open, and thus forcibly plucked away after great suffering, sometimes with little advantage to the patient and with much trouble to the surgeon.

Many extensive and severe operations have, since the year 1826, been practised on the upper jaw, principally for the eradication of malignant diseases, and, as I have said, with very indifferent success; so much so, indeed, that the operation has got into disrepute with the profession and public, as would any other proceeding, however regular or well established, if practised indiscriminately and without judgment.

The merit of suggesting the possibility and advantage of removing the entire superior maxillary bone, when the seat of disease, is, without doubt, due to Professor Lizars, for several years my colleague in the Edinburgh Royal Infirmary. The proposal, with directions for the operation, were published in his anatomical work, dated 1826. M. Gensoul, of Lyons, states, in his monograph on the subject, that he performed his first operation in 1827. Both these gentlemen seem to be sanguine as to the efficacy of this operation in ridding patients of malignant disease, and it is, without doubt, conceived on very sound and good surgical principles, with the intention of amputating in sound structure. But the cases must, from the nature of things, be of rare occurrence, in which benefit can accrue to the patients who are so unfortunate as to be seized with disease of a bad character in this situation, by their submit-

ting to operative procedure of any kind. Whenever the morbid growth has made its way through the parietes, when even a soft polypous-looking growth has resided but for a short time in the corresponding nostril, furnishing a copious, thin, and fœtid discharge, and connected with the encephaloid tumour of the antrum, then there is a certainty of the disease repullulating from the parts which surrounded the original nidus of the mischief. The surface may heal over, the cavity may appear to be healthy, and contract for a short period, but all the hopes of the patient and surgeon will soon be blasted by the reappearance of a new and rapidly increasing fungous mass. In many of the cases reported, the operator has found it impossible to get away all the altered parts; he has found the ethmoid cells full of soft pulpy matter; he has been unable to get away the attachments and roots of the tumour from betwixt the pterygoid processes; he has vainly hoped to destroy the unhealthy structure and action by escharotics or hot irons. In fact, the bones composing the most delicate part of the base of the cranium have been involved, and the disease is far beyond the reach of surgical means. In the very earliest stage of this horrible affection, when it commences in the maxillary antrum, there is a possibility, though remote, of permanently eradicating it; but, unfortunately, whilst still a chance remains of doing so, alarm is not felt by the patient, and advice is not applied for. When it is obtained, in consequence of

misapprehension as to its true nature, the disease is too often trifled with, and the only rational and proper means of cure delayed through irresolution or timidity. I was fortunate enough to meet with a case, undoubtedly of this bad nature, in its commencement. The operation was resorted to immediately. The patient has enjoyed good health for many years, and without doubt will now remain free from any disease in this region, connected with that extirpated.

CASE I.

"13, Golden Square, London, April 6th, 1836.

"MY DEAR SIR,

"Agreeable to your request, I transmit you the particulars of the case of the boy who was the subject of operation by you, for the removal of the superior maxillary bone; and whose case was not inserted in the Hospital Journal, in consequence of my indisposition at that period.

"William Thomson, from Stirling, æt. 16, a lad of spare habit, was admitted into the Royal Infirmary of Edinburgh, Dec. 22d, 1832, with a swelling of the left side of the face. On examination, this projection presented the following appearances. It was circumscribed, and strictly confined to the antrum, the parietes of which were expanded and apparently softened, especially on its anterior aspect. The tumour had a very elastic feel, and was a little painful when pressed. The corresponding nostril was quite free and unobstructed. The boy stated that he had al-

ways enjoyed tolerably good health; he has often had very restless nights; and been much troubled with pain, which was uniformly referred to the situation of the first molar tooth, which had been in a decayed state for a considerable time previous to his discovering any swelling of the cheek. Upon interrogating the lad more minutely, it was ascertained that he had observed some swelling two years previous to his admission into the hospital. He thought that the swelling had much increased during the last two months. I shall not allude to the manner in which the operation was conducted, as nothing unusual occurred. I may, however, observe, that very little blood was lost. The patient went on well till the fifth day, when he was attacked with erysipelas, which was then prevailing in the hospital. He had a great deal of fever and delirium, and ultimately, upon the rather sudden retrocession of the inflammation from the surface, he became suddenly comatose. These alarming symptoms were removed by the exhibition of stimulants, and the application of a very large blister, extending from the occiput to the middle of the back. In two or three days, all the unfavourable symptoms subsided; the boy rapidly recovered, and was dismissed from the hospital on the 28th of January following the performance of the operation, and with very little perceptible deformity. I suppose it would be unnecessary to refer to the appearance which the tumour presented immediately after its removal, as it exhibited the same

pale, soft, and homogeneous structure then, as at the present time. Believe me to remain, my dear Sir,

"Yours, very faithfully,

"G. JAMES,

"Late House Surgeon of the Edinburgh Royal Infirmary.

"R. LISTON, ESQ."

The morbid growth in this case had not attained any very large size. Its structure is decidedly brain-like, presenting a smooth, greasy section. At the upper part, towards the alveolar processes, it is broken up and bloody-looking, more especially at that part attached to the roots of the decayed molar tooth. I should be inclined to think, both from the history of the case, and from the morbid appearances, that the disease had commenced at this point, and extended to the lining membrane of the cavity, which it now fully occupies. That the progress and termination of this case, had not the diseased mass been timeously removed, would have been most unfavourable, cannot for an instant be doubted, and the patient has yet to congratulate himself that no reproduction of the tumour has taken place*. This disease is perhaps more frequently met with in persons of the middle period of life, yet this is not the only case I have witnessed in young subjects. One of the most rapidly malignant and frightful cases I have met with, was in the person of a young midshipman, of thirteen or fourteen years; the tumours filled the

* A preparation of the morbid growth, which was exhibited to the Meeting, is above referred to by the author.—SEC. R.M.C.S.L.

mouth and throat, and nostrils; the fungous protrusion had bled most profusely. The eye was beginning to project, and there was much œdema of the lids, and in fact of the whole side of the face.

Through the kindness of Mr. Forrest, surgeon, at Stirling, I am enabled to bring down the history of this case to a recent period. The following very satisfactory account is extracted from a letter, dated "Stirling, Upper Bridge Street, May 20th, 1836."

"The boy, Thomson, operated on by Mr. Liston, for osteosarcoma of the upper jaw, is alive and in excellent health. He is now a stout young man, following the trade of a shoemaker. I sent for him to-day, and examined his face very carefully. It is entirely free from disease. In fact, no surgical operation, whether you consider the state of the parts, or the general health of the person, ever succeeded better."

The three following cases are of a totally different character, and some of them having attained a most alarming size, they were dangerous and annoying, even from this cause, and also from their awkward position. The circumstances connected with the first three cases, are obtained from the journals of the Royal Infirmary of Edinburgh, and from the gentleman who at the time held the situation of house surgeon. The last case is taken from the records of the North London Hospital. Sketches of the last two patients made before and after the opera-

tions, (of the latter within a month,) will illustrate the mode of operating pursued, and the line of incision which was followed, with little deviation, in all. (See plates II. and III.)

CASE II.

Janet Campbell, from Grantoun, Inverness-shire, æt. 26, admitted Sept. 20th, 1830, into the Edinburgh Infirmary. Four years previous to her admission she received a blow on the left cheek by falling on the corner of a table. Little attention was at the time paid to the accident, but about two months and a half afterwards, one of the molar teeth gradually loosened and dropped out. Then a small, firm, fleshy tumour began to project from the surrounding gum, and slowly extended till the greater part of the alveoli on that side became involved, and the teeth loosened. Four months after the tumour was first observed, all the teeth in the left side of the upper jaw were extracted, a perforation was made through the gum into the antrum, and a small quantity of puriform matter evacuated. The aperture was kept open, and various washes injected: about a year ago it closed, and a slight discharge of matter flowed from the left nostril for some time. A perforation was again made into the antrum, but no matter came away. The cheek now began to enlarge, slowly at first, but during the last three or four months the tumour has developed rapidly.

Two days after her admission into the Infirmary,

the operation was performed. An incision was made with a strong and straight bistoury, from near the inner angle of the left eye, to the free margin of the upper lip, near to the labial fossa, detaching the nasal cartilage from the subjacent bone; another incision was made from the angle of the mouth to the malar origin of the masseter. The triangular flap thus formed, was then dissected up towards the orbit and os malæ, so as completely to expose the tumour. The malar connection of the bone, and the hard palate to the left of the mesial line, were divided by a small saw; separation of the other attachments was effected with the strong bone pliers and the bistoury. The soft palate was uninjured. Hæmorrhage was restrained during the operation, by an assistant compressing the carotid artery. Not more than three or four ounces of blood were lost; and after removal of the bone, not one ligature was required; there was merely a slight oozing from the surface. Compresses of lint were placed in the cavity, and the facial flap having been replaced, was carefully approximated and retained by interrupted and twisted sutures.

By the third day adhesion of the flap was perfect; the stitches and needles were withdrawn, and a few slips of adhesive ribbon placed over the part. The lint was gradually removed from the cavity, which was found florid and granulating.

No untoward symptom has occurred; the patient keeps the cheek supported by dossils of lint, and the

internal wound is contracting rapidly by healthy granulation. The countenance is rather improved, certainly not disfigured; and the eye, though deprived of the orbital plate of the maxillary bone, has its natural appearance, excepting a very slight eversion of the lower lid.

The tumour was found to be of a dense fibro-cartilaginous structure, with a small cavity in its centre containing purulent matter, probably the effect of the last puncture. This patient presented herself at the hospital in the end of 1833 or beginning of 1834, perfectly well, and free of disease.

CASE III.

Mrs. Fraser, æt. 40, from Banchory Ternan, Aberdeenshire, was admitted into the Royal Infirmary of Edinburgh, on the 13th of October, 1834, under the care of Mr. Liston.

About six years ago she received a blow over the antrum from the head of a child, immediately after which she perceived a slight hardness in the part which had been struck. This did not increase for some time after, but at the end of two years a distinct tumour was felt on the cheek. It grew very rapidly during the two following years. At this time she became pregnant, when, she says, it increased very much, especially after the quickening of the child. She has never suffered very much pain in it. About a year ago she had another child, since which time the catamenia have never appeared. The tumour

seemed to her to grow more vascular after she had passed the menstrual period, and since then bleeding to a slight extent has occurred from the unbroken surface ofthe gums and inner surface of the tumour at those times when she should have been unwell.

On her admission the tumour presented the following appearance.—The left side of the face is completely occupied by an immense growth, which obstructs the eye of that side, rising to a level with the forehead, extending back to the ear, and bulging down below the inferior maxilla, but not attached to it. From the part of the tumour next to the ear to that part in front of the face it measures about nine inches. The mouth is completely drawn to the left side, and there is a constant discharge of saliva from it. She keeps a handkerchief constantly applied to it by the hand, to concentrate the sound of her voice when speaking, and to collect the saliva. She is unable to open her mouth above three-fourths of an inch. The tumour bulges considerably into the cavity of the mouth, but there is no difficulty of swallowing. The nose is also twisted to the left side, but she can breathe through it pretty easily. From these distortions the face has a truly frightful appearance. Numerous large veins are seen beneath the integuments of the tumour, and arteries of considerable size are felt beating in it. Her general health is good, and she has firmly made up her mind to undergo the operation for removal of the tumour, on account of its inconvenience and unsightliness.

An assistant being ready to compress the common carotid, the soft parts were divided by an incision which traversed the mesial surface of the tumour, and terminated in the angle of the mouth. The alveolar process, (the two central incisors having been previously extracted,) the palatine plate, and the nasal process of the maxilla were then cut with the forceps. An incision was carried along the upper surface of the tumour under the inferior eyelid to over the junction of the malar and frontal bones, and prolonged from that, in the line of the zygoma, to near the auricle. The bones were then cut, into the spheno-maxillary fissure and through the zygomatic arch,—all this was done with but little interference with the vascular supply. The connection being loosened, and the tumour shaken to its base, the soft parts underneath were divided, and the mass was turned out without difficulty. The patient, who had borne all this with the utmost courage and without a murmur, was removed from the sitting position and laid on a mattress on the operating table, with the view of preventing syncope, and the bleeding vessels were secured. Nothing interrupted her recovery, and the deformity is much slighter than would be imagined. The patient returned the following summer to have a palate fitted; on account of a miscarriage she remained for a short time in the infirmary. She now enjoys excellent health, as appears by the following extract of a letter received on the 12th instant from Francis Adams, Esq., surgeon, Banchory, the learned translator of

the works of Paulus Ægineta, under whose care she has been, and by whom she was recommended to consult me.

"Having seen the mother of the lady with the gold palate yesterday, I am enabled to assure you that she continues perfectly well. She finds Nasmyth's apparatus answer admirably, and has completely recovered her voice, which you may remember was somewhat indistinct for some time after the operation. In a word, she is one of the most happy women I am acquainted with."

CASE IV.

Ann Struther, from Hull, æt. 21, was admitted into the North London Hospital, February 24th, 1836, under the care of Mr. Liston. Four years ago she was much annoyed with pain in the left side of the head and face, occasionally attended with swelling, which she attributed to exposure to cold. Pain in the teeth of the left superior maxilla supervened, and a tumour appeared on the outer surface of the gum. Three teeth were extracted, with the hope of giving relief, but the swelling afterwards rapidly increased. When it attained the size of the end of the thumb it was removed by the knife. This was about six months after the first complaint of pain. The tumour, however, soon reappeared, and continued to enlarge for about eighteen months, when she again submitted to a severe operation, by which the alveolar process of the superior maxillary bone, and a portion of the tumour, were removed. This operation was attended with and fol-

lowed by profuse hæmorrhage, but the wound healed nevertheless at the end of a week. Two or three weeks after this operation the tumour again appeared, and it has continued to increase in size up to the present time. When last removed it was about the size of a hen's egg. It is now as large as a moderate-sized cocoa-nut, causing great deformity. The mouth is drawn to one side, and the vision of the left eye partly obstructed. She complains of very little pain, and her general health is good. The swelling is of firm consistence, and appears to involve the whole of the superior maxillary bone; internally it occupies the whole of the palate, but is unattached on the right side; a probe can be passed under it for some distance. It extends as far back as the finger can reach, and projects over the velum, concealing a great part of it. The patient came to town expressly to have the tumour removed, and on Saturday, the 27th February, the operation was performed.

After removing the central incisor of the left or opposite side, which was rendered necessary by the extent of the tumour, Mr. Liston commenced an incision a little below the inner angle of the eye and carried it obliquely under the corresponding ala of the nose, detaching its cartilage from the bone, then through the lip into the mouth, in the mesial line. An incision was next made from the prominence of the cheek to the angle of the mouth. The flap thus formed was reflected upwards. The tumour, it was now ascertained, extended considerably backwards,

and it was necessary to make another incision, nearly at right angles, on the outer perpendicular one, in the line of the zygomatic arch; the tumour was thus exposed throughout its whole extent. With strong cutting forceps the nasal process of the superior maxilla was divided; the operator next cut through the zygomatic arch, near the auricle, and then through the malar bone at the transverse facial suture into the spheno-maxillary fissure; the diseased maxilla was separated with great facility from its fellow of the opposite side, by strong scissors, leaving the palatine plate of the palate bone and velum palati entire and untouched; the superior maxillary nerve was carefully divided. The diseased mass was now readily removed, involving the whole of the superior maxillary bone, the whole of the malar inferior spongy bone, and the zygomatic process of the temporal bone. The internal maxillary artery, which bled not very freely, was immediately tied, and the edges of the flap brought together by five points of twisted and two of interrupted suture. The whole proceeding occupied under six minutes. The tumour was of a firm fibrous structure, interspersed with spiculæ of bone, perfectly entire. Not the least particle of diseased structure could possibly be left behind, as the tumour came out unbroken and surrounded by cellular cyst. The wound was completely healed, and the tumefaction almost gone, on the 26th March; she was in good health and spirits, and the cheek on which the operation was performed looked nearly as well as the other; up to the present time she has not had one

bad symptom, and the space occupied by the diseased mass has gradually decreased in size. She returned home soon after the date of the last report*.

In a great many of the operations which, in the commencement of this paper, I have referred to, a dread of hemorrhage seems to have pervaded those concerned, and precautionary measures were accordingly adopted, as by Messrs. Lizars, Scott, Syme, Guthrie, and Earle. In some of the cases the vessels going to the parts to be removed were exposed by incision, so that they might be compressed more effectually. In others temporary ligatures were applied, and in some the principal branch of the external carotid was secured. In others the current of the blood in the common carotid was arrested by deligation, temporary or permanent; this had not, however, in some of the cases the effect of moderating in any great degree the flow of blood, or of adding to the patient's safety. In one instance, already alluded to, the common carotid was tied, incisions of the cheek

* Extract of a letter from Mr. Sherwin, surgeon, Hull, dated May 31, 1836, regarding Mrs. Struther's case.

"Her case goes on beautifully; not the slightest vestige of disease, and what is of great importance, that hideous cavity in the roof of the mouth is so far filled up that a hole no bigger than the tip of my finger remains to be closed, which, from the appearance of its edges, is likely to fill up almost entirely. The œdema is going off from the eyelid; the contour of the countenance is well preserved notwithstanding the cheek being fallen forward considerably, so much so indeed as to bring Mr. Liston's second incision into the middle. I very much doubt whether she will ultimately require an artificial palate."

and palate, if I am not misinformed, were accomplished; but still, owing to profuse hæmorrhage, the after proceedings were delayed. In eight days after this the common trunk of the temporal and internal maxillary was tied on the side opposite to the diseased cheek, and a second and unsuccessful attempt to remove the whole of the tumour and bones made. In all the cases in which I have been concerned, the temporary arrestment of bleeding was provided for and accomplished by pressure on the common carotid of the affected side. The common carotid has been tied successfully, in cases of tumour composed of erectile tissue in the orbit, and it is said that the same success has followed the practice when the disease was located in the antrum of Highmore. The notion that malignant growths which affect this region should be controlled, far less overcome and cured, by partially cutting off and weakening the supply of blood to them for a short time, cannot be seriously entertained by any one acquainted with their disposition, action, and progress.

Some of my patients lost not more than eight or ten ounces of blood in all; very few vessels in any of them required ligatures. In the second case none were tied, and in the last only one, and that did not bleed very freely. The circumstance of the internal maxillary not furnishing much blood, during or after the operation, may be accounted for readily, from the nature of the operation, the course of the artery, and the place at which it enters the morbid mass; there is scarcely a possibility of reaching this vessel so as

to divide it with the knife: it is elongated, and its internal coats must give way as the tumour is depressed: it thus furnishes very little if any blood. After the removal of the tumour it appears so long, and generally projects so much into the chasm, that it can readily be seized even with the fingers, and secured by ligature if necessary.

The line of incision which I have followed may be seen on the sketch, Plate III. fig. 2., from the patient Struther, the subject of the fourth operation; she, however, bears the marks of incisions made in a previous operation; one of these from the angle of the mouth towards the ear is most conspicuous. These were the marks of incision made by Mr. Lyon, then practising at Hull, who, I doubt not, had he been well assisted in the operation would have accomplished the complete removal of the disease. The line from the external angle of the eye to the corner of the mouth, and the other from the internal canthus to the middle of the upper lip, mark the line of incisions followed by me, and are similar to those, as regards their direction, which were made in the first and second cases. The incisions in the third case were necessarily varied. The integument was thinned from extreme distension, and pervaded by numerous arterial and venous branches, and thus much discoloured. I feared to save much of this skin, having seen in a former occasion the bad effects of such proceeding. The case alluded to was one of enormous tumour of the lower jaw, requiring disarticulation. The skin thus thinned was saved in sufficient quantity to cover the surface

exposed after removal of the growth; this integument possessing little power of life, sloughed after only little excited action had taken place, the sloughing, with much swelling, from putrid infiltration of the cellular tissue under the fascia, extended to the fore and lateral parts of the neck, and the patient perished. The discolouration of the integument in Case III., Plate II. fig. 1., did not alarm me, as it would have done had the subjacent tumour been of a malignant kind, and it was not removed from any dread of diseased action springing up from this tissue, as is usually the case in that latter form of disease when any, the smallest patch of inflamed and discoloured skin happens to be left. Though a great deal of skin was taken away, the deficiency was not so great as might have been anticipated,—a plate filling up the palate was very ingeniously fitted by my friend Mr. Nasmyth, of Edinburgh, with a portion attached to fill up the space (not very large) in the cheek. Besides removing the deformity, the patient is thus enabled to swallow comfortably and articulate distinctly.

During the cure, and until the edges of the opening in the palate have cicatrized, and until the aperture has contracted as far as it is inclined to do, the patient is rendered more comfortable by wearing a little paste made of crumb of bread well kneaded; this prevents foreign matters lodging in the wound, improves speech, and forms no bad dressing, a poultice in fact to the part. It is wonderful how much, after these operations, the parts come together. The opening in the patient Struther, from which the tumour,

of no inconsiderable size, was removed, on her departure for home, five weeks after the operation, would barely admit the point of my thumb. It will close further, and then I doubt not that some of my friends who attend to the maladies, derangements, and deformities of the mouth will lend me their assistance in closing what remains, artificially *. The line of incision is, if I may presume to say so, preferable to that pursued by M. Gensoul and others, as leaving much less deformity, and affording equal facility for the ulterior object of the operation. No dressing has been applied in any of the cases to the external wounds. When it is of consequence to promote immediate union, and thus prevent disfigurement as far as possible, I have thought that any application on the line of incision is apt to interfere with and mar this object.

It must appear evident to all, that the more rapidly, consistently with safety, these operations (under any circumstances of great severity and attended with much suffering to the patient) be accomplished, the better. A great deal of time may be saved by adopting means to divide the bones cleverly. I have uniformly used for this purpose the cutting forceps, which some years ago were introduced into surgical apparatus, I believe, in a great measure, at my recommendation. The superiority and facility afforded by the employment of this instrument over the others

* Since that period it is reported to have contracted very considerably, so that it is doubtful if an artificial palate will be required.

used for separating these bones, will be apparent to any one who will make the trial; in fact the processes of the superior maxillary and malar bones are cut with as little exertion and as smoothly, by one who has accustomed himself to the use of the forceps, as a split straw would be with a pair of fine scissors. The cutting forceps are applied with much greater ease both to patient and surgeon, and the work is much more certainly and readily completed than by means of the saw of the simple, chain, or circular kinds. Much difficulty has been experienced in fixing the osteotomes, as it is now the fashion to denominate those complicated machines, and the extent of their action is not easily limited to the hard parts. The same objections may be urged against the use of the chisel and mallet. How such instruments could at this period be selected for the purpose I cannot comprehend. If one were desirous of protracting an operation and adding to the patient's sufferings, of jarring the bones of the face and head and jumbling their contents, no more effectual means could by any possibility be contrived. The proceeding was much complained of in M. Robert's case, and I doubt not in others.

On another occasion, I may perhaps lay before the Society some remarks more particularly regarding the tumours arising from the lower jaw, and on the operations for their removal by section and disarticulation.

NOTE.

Since these observations were read to the Society, two patients labouring under tumour of the upper jaw have presented themselves at the North London Hospital, and have submitted to operative procedure. The first of them, (of whom a representation is given, Fig. 2, Plate II.,) had laboured under the disease for eight years, and had been subjected to a partial removal of the growth when of inconsiderable size. The tumour was of the same nature as those of the third and fourth cases, related above, as regards its disposition, form, and intimate structure. It differed somewhat, however, in outward appearance, in consequence of its exposed situation. The growth sprung originally from the gums and sockets of the incisors and canine tooth of the left side; at an early period it protruded from the mouth, unconfined and uninfluenced by the pressure of the lips or cheek. It had assumed a most formidable size and appearance, concealed the palate and pharynx, and gave rise to great inconvenience and continued suffering. The surface had been broken by ulceration, but upon a close inspection of the projecting part, and of that covered by the cheek, it was found to possess a firm consistence, and to present the same peculiar botryoidal arrangement of its parts, as the others of a simple and benign nature. The operation proved perfectly successful, and a permanent cure may, with confidence, be announced. The patient still remains in the hospital, until some œdema of the cheek disappears, so as to admt of the obliteration of two notches in the upper lip, the result of the former operation. The second case was of a more unfavourable nature, both as regards the kind of disease and the result. The tumour was of comparatively inconsiderable size, and of firm consistence, but communicating, at some points, an elastic feel. The parietes of the antrum, in which it was evidently seated, were unbroken. No fungus had penetrated the cavities of the mouth or nostril. The patient stated that he had led a temperate life. An unfavourable impression was taken of the case, and an excuse for avoiding interference was anxiously sought in vain. The urgent request of the patient was acceded to. The whole diseased mass was removed, as as-

certained on careful post mortem inspection, without loss of time, and with inconsiderable hæmorrhage. The shock of the operation, however, proved too much for the man's system, enervated, as it afterwards appeared, by a course of dissipation and drunkenness. The tumour had extended backwards, and its attachments to the palate bone and pterygoid process were separated with difficulty. It consisted externally of cartilaginous matter, mixed up with glairy albuminous deposit. The section presented also the remains of a clot, the result, probably, of a severe blow, to which the disease was attributed, together with a morbid mass of the consistence of cheese, yellowish, streaked with blood, and evidently originating from the lining membrane of the antrum. Both cases are correctly reported in the Lancet, Vol. I. 1836-7, pp. 237 and 343.

ON
INFLAMMATION,
CHRONIC DISEASE,
AND PERFORATIVE
ULCERATION OF THE CÆCUM,
AND OF THE
APPENDIX VERMIFORMIS CÆCI,
WITH
SYMPTOMATIC PERITONITIS AND FÆCAL ABSCESS.

By JOHN BURNE, M.D.,
PHYSICIAN TO THE WESTMINSTER HOSPITAL.

READ MARCH 28TH, 1836.

The diseases of the cæcum and of the appendix vermiformis, which form the subject of this paper, have received no separate consideration in the systematic works on practical medicine; nor have I met with any notice of them except in the medical periodicals, in which detached cases have from time to time, been published.

The diseases in question are, nevertheless, of frequent occurrence, are always dangerous, often fatal, and characterised by a train of symptoms so peculiar and marked as to render the recognition of them certain and not difficult.

So long as sixteen years ago, my attention was at-

tracted to inflammation of the cæcum, by the case of a young lady who had become suddenly ill, with obstinate constipation of the bowels and vomiting, accompanied by febrile movement and local symptoms centered in the right ilio-inguinal region. The complaint was manifestly inflammatory; but the inflammation and febrile movement were developed less quickly than in an ordinary idiopathic inflammation, and it did not yield to treatment nor yet run on to the rapid destruction of life like an inflammation of the idiopathic kind. The case was obstinate, tedious, and dangerous, though eventually it terminated favourably. Reflecting on all these circumstances, and on the organization of the region of the abdomen to which the symptoms were referred, I suspected the cæcum to be the seat of the disease, and that the inflammation arose from the accidental lodgment of some undigested substance, fruit probably, for it was in the autumn season, and the young lady had been eating freely of plums.

Other similar cases occurring from time to time, confirmed my suspicions. I have seen in the whole not less than twenty, of which some having recovered, others having terminated fatally and allowed opportunities of ascertaining by dissection the anatomical characters of the disease, materials have been furnished from which I hope to be able to lay before the Society a connected history of these affections. I am moreover anxious to direct the attention of the Society and of the profession to these cæcum and appendix cases, because they are apt to be confounded

with idiopathic abdominal inflammations, and to be treated as such, much to the injury, if not to the destruction, of the patients.

An idiopathic inflammation of the cæcum from the ordinary general cause, exposure to the vicissitudes of the weather, has not fallen under my notice. The inflammation of which I am about to speak has in every case been symptomatic of some mechanical exciting cause, as the lodgment of undigested food, of fruit-stones, or of concretions, which the structure of cæcum and appendix favours; and hence the peculiar features of the disease.

The peculiarities of this inflammation produced by such mechanical causes are, the marked and fixed local signs; the invasion of them without any obvious cause, while the patient was in health; their gradual development; their obstinacy; the late supervention of the febrile movement, and its less degree in proportion to the local affection and suffering; and the less anxiety depicted in the countenance than is noticed in the idiopathic enteritic inflammation. These are the peculiarities.

In all the examples of inflammation of the cæcum which I have witnessed, the development of the symptoms has been in the following order. The first sign is a sense of uneasiness which soon amounts to an aching pain, deep-seated in the right ilio-inguinal region, arising unexpectedly while the person was in health, and not preceded by rigor or exposure. This pain increases progressively for twelve or twenty-four hours, retains its character, is fixed and con-

stant, never even remitting. Then supervene gradually tenderness, fulness, and tension of the whole ilio-inguinal region; the bowels are constipated and do not reply to medicine, and the patient grows sick and vomits. Some febrile movement now begins to manifest itself, the tongue becomes white and furred, the urine scanty; the appetite is gone, the pulse is frequent tight and sharp with increased volume, but the stroke though sharp is not strong, nor is its impression on the finger decided, it is a pulse of irritation and inflammation combined; the patient lies on the back quite still, slightly inclined to the side affected, and the case presents a serious aspect.

This state of things will persist for several days, the pain remaining of a very severe aching character. The fulness and tension of the part will increase and extend to the other regions of the abdomen, which hitherto had been soft and not tender; and a sign will now be present in an eminent degree characteristic of this inflammation, it is an *exquisite tenderness* of the abdominal parietes covering the cæcum, a tenderness far exceeding that of an enteritis, even of a peritonitis; the patient will scarcely allow a finger to be laid upon the part; when you go to examine it he lays hold of your hand and supplicates you in an earnest manner not to touch it, not to hurt him; he cannot bear the weight of the bed-clothes upon it: the tenderness is as exquisite as in any case of acute rheumatism I ever saw. The constipation continues, but the vomiting does not become frequent and dis-

tressing as in enteritis, nor does the face betray so soon the anxious aspect. Taking the case altogether, it is not such an imminent affair of life and death as an enteritis, though in the sequel it may prove equally fatal. Such are the signs of the symptomatic inflammation of the cæcum.

A favourable termination cannot be calculated upon till alvine evacuations have been procured, followed by a subsidence of the tenderness, tension, pain and vomiting, all which can seldom be accomplished in less than seven or eight days. It may happen that the bowels cannot be brought to act, that the local signs do not give way, that the vomiting continues, and that the patient's strength declines seriously about the eighth day, especially if much blood has been abstracted; then he seems to sink rather from exhaustion of the powers of life than from the effect of the inflammation, and so he dies. Or, if life is prolonged, there may be discovered about the tenth day a circumscribed emphysematous tumour, presenting in front in the right ilio-inguinal region, or posteriorly in the corresponding ilio-lumbar region, which will prove to be a fæcal abscess making its way to the surface of the body. Ulcerative perforation of the anterior or posterior part of the cæcum will have taken place: if of the anterior part, adhesion will have formed around the perforations, and thus the fæcal abscess will arrive at the circumference of the body without involving the peritoneum in a general inflammation; if of the posterior part, which has no peritoneal tunic, then the peritoneum will escape

altogether, and the abscess tend upwards and backwards to the least resisting part of the lumbar parietes, which is at the outer edge of the quadratus lumborum muscle. This abscess may discharge itself and the patient do well; or nature may be unequal to the task, and the patient sink exhausted.

The *diagnosis* of these cæcum cases is determined with precision by the seat of pain, the exquisite tenderness, and the tension—by the sudden invasion of the symptoms while the person was in health—by the local signs preceding the development of the febrile movement—by the degree of fever being less than in idiopathic inflammation, and by the less marked anxiety of the countenance. If any doubt remain, it will be dissipated by laying the hand upon the part, when the circumscribed fulness and hardness in the region of the cæcum will give assurance of the seat and nature of the affection. A practitioner who witnesses one of these cases for the first time is satisfied it is not a common inflammation of the bowels, although he does not know its exact nature: he says the case is a curious one; he cannot make it out.

The *treatment* will not be difficult to determine, nor will it be often unsuccessful if an accurate judgment is formed of the nature of the disease; but, if the case should be mistaken for an idiopathic inflammation and blood-letting be pursued actively in the expectation of subduing it, the patient will be hurried into danger, perhaps destroyed by the remedy: for the cause of the inflammation being mechanical, the inflammation will persist until the cause is removed. It

will be in vain, therefore, to expect to subdue the inflammation while the cause continues in operation: the abstraction of blood will at all times give a temporary relief, which allures practitioners on to persevere in its use to an unwarrantable and dangerous extent.

The indications in the treatment are, first, to moderate the inflammatory action to a degree consistent with the vitality of the organ affected, and with the life of the patient: secondly, to accomplish this with as little expense to the bodily powers as possible, in order that, should a fæcal abscess form, nature may be able to go through the tedious and difficult process which would be inevitable. Blood then should be drawn with discretion, the quantity should not be large at any time, and a repetition of the blood-letting should not be practised at so short an interval as in enteritis. Leeches are an excellent means of relieving this local affection, but even these should not be used in large numbers nor too frequently. Eight or ten are as many as should be prescribed at one time, and they may be repeated daily at first, then every alternate day, with advantage. After the leeches, a warm oatmeal poultice should be carefully applied, not too thick nor too heavy, or the weight will not be borne. The leech-wounds should not be allowed to bleed more than one hour, or the patient may be drained of blood injuriously. The colon should be evacuated by a domestic enema, and aperient medicines be given with a view to dislodge the offending matter: an excellent

form is one drachm of the sulphate of soda in half an ounce of infusion of senna, to which may be added four drops of tincture of opium, to appease the stomach. The stomach, however, is not very apt to reject medicine, because the vomiting is not very urgent nor very frequent. Should the medicine not be retained, then infusion of senna, with tartarized soda, carbonate of soda, and tartaric acid, in a state of effervescence, will be preferable. Should this prove ineffectual, it may be proper, lastly, to resort to the compound extract of colocynth, calomel, and opium, in doses of six grains, two grains and one grain respectively every six hours. It rarely happens that blood is required to be drawn from a vein a second time, the local abstraction by leeches being more likely to relieve the local affection with less sacrifice of strength. A fomentation, dexterously and lightly applied and persevered in, will prove a most valuable auxiliary; the hot-bath should not be proposed, any motion of the body being too painful to admit of its use. About the fifth or sixth day, the bowels may begin to act, and lumpy pieces of undigested matter may or may not be recognized in the dejections, after which the symptoms will gradually subside and the patient recover.

Or the symptoms may persist, in which case it behoves the medical attendant to watch the intentions of nature, as a tumour may shew itself in the ilio-inguinal or lumbar region, which should be encouraged to the surface by poultices; and the moment an emphysematous condition is distinguished, a free inci-

sion should be made, when a fœtid gas with an offensive fluid will be discharged, and the cellular tissue discovered to be gangrenous. The tumour having been laid open, the patient's powers will require to be sustained by broths, arrow-root, weak brandy and water, ammonia, and as soon as possible by the decoction of bark, a form preferable at this time to the quinine, and an opiate in full dose should be given at night to procure rest. With this treatment patients will struggle through a long and most dangerous illness; but, I repeat, if blood has been abstracted copiously under the impression of the inflammation being idiopathic, the powers of life will be unequal to maturate the fæcal abscess, should one form, and the patient will fall inevitably a sacrifice to the error.

CASE I.

Inflammation of the Cæcum, from the lodgment of some undigested matter probably.

Charles Neale, a healthy boy, twelve years of age, was seized about a fortnight before Christmas, 1828, on a Sunday morning, with an aching pain in the right ilio-inguinal region, which obliged him to leave the church, and kept him crying all day. The pain increased as the day advanced, did not remit nor recur in paroxysms, but remained fixed and constant. On the morrow he began to be feverish and to vomit. On the third day he was seen by a medical practitioner, who applied leeches to the seat of pain and administered aperients; and on the fourth

day, the symptoms increasing, blood was drawn to fifteen ounces, a large quantity for a boy twelve years of age: strong aperient medicines were continued. On the fifth day more leeches were applied, after which I was called in consultation. I found the boy lying on his back quite still, careful not to move his body lest it should aggravate the pain: the whole abdomen was tumid and tense, more particularly in the right ilio-inguinal region, where was a fixed aching pain, with tenderness so excessive that the slightest touch was reluctantly borne, while over the other regions of the abdomen the tenderness and pain were trifling: he was sick, and vomited from time to time; the tongue was foul and brownish; the pulse frequent and weak; and there had been no action of the bowels since the commencement of the illness, now six days, except from the colon by an enema on the second day. The case was recognized by me at once as an inflammation of the cæcum, excited probably by the accidental lodgment of some undigested matter.

The boy was low and much reduced by the loss of blood and the length of suffering, yet the countenance did not betray anxiety in a degree relative to the other symptoms, which gave hope of a favourable issue. The exhausted state of the patient determined me to advise that all active measures should be laid aside, that no more blood should be drawn, that the strong purgatives should be discontinued, and gentle saline aperients administered in their stead; that the local symptoms

should be soothed by fomentations, and that, relying upon these means, we should for a time wait the result.

On the day following, (the seventh of the disease,) I was gratified to find that he had slept through the night, that the bowels had acted several times, and some hard lumpy matter been discharged; that the tenderness, pain, and tension had diminished, and that thus all obstacle to recovery had been removed. From this period the boy's health was quickly and perfectly re-established.

The above case is illustrative of a fact I have often observed, namely, that obstructions of the bowels which had resisted strong purgatives have eventually yielded to gentle saline aperients. In the case of an elderly lady labouring under an alarming obstruction of the bowels from incarcerated umbilical hernia, which persisted after the hernia had been liberated, strong purgatives not only failed to relieve the obstruction but kept up the vomiting; while the stomach became quiet, and the bowels acted under the use of mild saline aperients.

CASE II.

Inflammation of the Cæcum from the lodgment of a piece of apple.

For this case I am indebted to my friend Mr. Selwyn, of Ledbury. "I have met," he says, "with some very obscure cases connected with inflammation about the cæcum. I was called, on the 22d of February, 1827, to Mr. Frank, a farmer,

whom I found complaining of extreme pain and tenderness in the situation of the cæcum, and on very careful examination, I discovered a hard body which I conceived like something lodged in the blind extremity of that gut. The bowels had been constipated for a week. I treated the case as inflammation; bled him six times in four days, and applied leeches in large quantities. The case terminated in a very satisfactory manner, although at one period, I could not tell which way the balance would go, when the bowels began to act copiously, and he voided what I fancied was the foreign substance, which the nurse had unfortunately thrown away, so that I did not see it, but she and a friend describe it as being a large piece of undigested apple; and on questioning Mr. Fawk, he recollected having swallowed accidentally a piece of a very hard apple a fortnight before."

It is a fact, established by pathological anatomy, that those parts of the intestinal canal where its dimensions vary and its organization changes, are particularly liable to be affected with chronic disease. The cæcum is one of these parts; and in addition to the acute inflammation which has been described, it is not unfrequently the seat of a subacute chronic inflammation or pathological congestion, which induces thickening of its tissues and contraction of its natural capacity, impairing thus the organization and function of the gut, so as to render the action of the bowels irregular and difficult, and eventually

to determine a complete and fatal obstruction. This diseased condition of the cæcum may exist for several months or even years, accompanied always with alvine difficulty and sympathetic disturbance of the stomach, of the same character exactly as that which attends stricture of any part of the alimentary canal. The sufferings are similar, the health declines, the body wastes away, and patients die worn down by sickness, inanition, and the dreadful spasmodic pains arising from the violent efforts of the bowel to overcome the obstruction. When emaciation has arrived at a considerable degree, the powerful peristaltic action may be felt, even seen, heaving the abdominal parietes in tracts corresponding with the convolutions of the intestines.

CASE III.

Chronic Thickening and Contraction of the Cæcum: Obstruction, more or less, for several months: Sickness, emaciation, death.

Ann Morris, aged 31, was admitted into Guy's Hospital in August, 1830, in a very emaciated state from an illness which had afflicted her many months, and of which the prominent symptoms were an obstinately constipated state of the bowels, together with sickness so frequent that the greater part of her food was cast up again. She complained of pains in the belly like the throes of labour; and in the right ilio-inguinal region was discoverable a small hard tumour, which I concluded to be the cæcum diseased: the abdomen was tumid and flatulent, and a strong vermicular motion within the belly was observable,

corresponding exactly with the peristaltic action of the intestine; besides which, the distended convolutions of the small intestines could also be accurately traced by the undulating elevations of the abdominal parietes.

Various means, as magnesia, soda, leeches, lime-water, opium, hyosciamus, and clysters were employed by her physician without benefit, and in the course of a fortnight shē sunk and died.

On *dissection* the cæcum was found to be thickened and much contracted, the ileon distended with flatus and loaded with fæculent matter, while the colon was empty and contracted. The sigmoid flexure of the colon was stretching over to the right side in contact with and adhering to the cæcum and ileon by fibrine recently effused; a singular circumstance, leading to the belief that nature was endeavouring to effect a communication with some part of the intestine above the obstruction, which would have restored the channel of the bowel, and perhaps have saved the life of the patient, if her powers had not sunk before the completion of the process.

CASE IV.

Disease of the Cæcum, with organized bands stretching across its cavity in different directions, forming a net-work and causing obstruction and death: vast accumulation of fæces above the obstruction, ileus, and sero-enteritis.

The subject of this case was Mary Ann White, a patient of the Public Dispensary, in the year 1830,

twelve years of age, of small stature, her frame of body not exceeding that of a girl eight years old, though in no way deformed, while her face was fully developed. Ill-health, it was said, had impeded her growth for several years.

The history of her complaints, as far as I could ascertain, was, that she had suffered for two or three years from large tumid abdomen with a very irregular and difficult state of the bowels, flatulence, spasmodic pains, loss of appetite, continued emaciation, and frequent attacks of sickness and vomiting. The dejections were generally scanty, soft, and very offensive, characters indicative of obstruction from organic disease. A fortnight preceding her death, she was seized with unusually severe pain in the belly, followed quickly by sickness and vomiting: the abdomen was immensely distended, and very tender all over; and the dejections consisted only of mucus, without any trace of fæculent matter. The vomiting continued till her death, prior to which, for some days, the matter thrown up was distinctly fæculent, constituting the ileus of nosologists.

Sectio-cadaveris, 14 hours after death.—The body was emaciated to the greatest degree: the abdomen enormously distended, and its surface varied by furrows and bulgings, caused by, and corresponding with, the convolutions of the small intestines. The abdomen opened, the small intestines were seen distended excessively, being three or four inches in diameter, of a mottled livid red, and agglutinated together by soft albuminous matter. Tracing the

intestinal canal, the seat of the obstruction was found at the cæcum, to which point the distension of the bowels continued, while beyond it the colon was empty, contracted, and sound.

The cæcum, when removed and examined, proved to be contracted and thickened, its tunics being blended together, and transformed into a dense, opaque, white, unyielding gristly substance; and interiorly were discovered numerous organized bands covered with a smooth shining membrane, stretching across the channel of the gut from side to side, in various directions, forming an irregular coarse net-work. In this contracted cæcum and net-work, a complete obstruction had been formed by fæculent matter, dry and friable, plugging up the channel in a manner which nothing could have removed. Leading to this part was the ileon, filled with an amazing quantity of soft, yellow, homogeneous fæculent matter, the bowel itself having all its tunics confounded together, and converted into a dense strong tissue, a line in thickness, resembling thick wet parchment: all trace of villous structure, or valvulæ conniventes, having disappeared. The colon was healthy. The uterus * not larger than the half of a small filbert.

The nature of the organic changes, just described,

* I have seen many instances in which the development of the sexual organs has been interrupted by organic disease of some viscus. If the individuals have lived, the menstrua have either not appeared, or have been scanty, pale, and irregular. Visceral disease may, therefore, be ranked as one cause of amenorrhœa.

points to the cæcum as the cause of all the complaints, but how disease in it was originally excited, it is impossible to determine.

In chronic obstruction of the bowels from stricture, or other disease, it is not uncommon for attacks of peritoneal inflammation to supervene, excited by the distension, as in the case above described. Several attacks will succeed each other at longer or shorter intervals, marked by the characteristic signs.

And I have noticed that the fæculent matter, however large the quantity, above an obstruction, is invariably soft and homogeneous, a state strongly contrasted with the hard, scibalous state of fæculent matter detained in the bowel by ordinary constipation. It would seem to be a provision of nature to preserve the fæculent matter, above an obstruction, in a soft state favourable to its passage through it, and remarkable it is that immediately any portion of this has passed the obstruction, its liquid parts are absorbed, and it becomes hard and friable as in habitual constipation, changes which, if they took place in the fæculent matter above a stricture, would be productive of total obstruction and death in every case.

CASE V.

Fæcal Abscess in the right Inguinal and Iliac Regions from ulcerative perforation of the cæcum.

Ann Box, aged 14, admitted into Guy's Hospital, on Monday, the 2d of November, under the care of

Mr. Key. She was naturally healthy, and reported that as far back as Christmas last, a period of ten months, she received a kick from her mother-in-law, in the right groin, which left a considerable contusion for the space of a week, and then got well. In May following, she was seized rather suddenly with pain, deep-seated in the right ilio-inguinal region, on which supervened tenderness, obstinate constipation, and vomiting. Her medical attendant, Mr. Hickman, bled her, and having also leeched and blistered the part, she seemed to be getting well, when a swelling took place, which threatened to be an abscess. By the aid of leeches, this subsided very much; yet a tenderness remained, and the patient could feel a small lump inside, which was always so sore that she guarded it with her hand if any one came too near her. In this state things continued for five months, viz., to the end of October, on the 24th day of which, on a Saturday, she was seized in a moment with a violent pain in the region of the sore lump, followed quickly by shivering, vomiting, and purging. Mr. Hickman saw her again, and applied leeches, which gave ease; but the part enlarged gradually, and became red; the sickness continued, shivering recurred frequently, and the bowels having kept open till the 31st, became then obstinate.

On the 1st of November, she was seen by Mr. Key, the swelling had assumed the character of a deep-seated abscess, which he punctured, and there came away a few ounces of thick bloody matter, of a very offensive fæcal odour. Next day, she was ad-

mitted into the hospital, and I had an opportunity of examining the part, and witnessing the progress of the case. The puncture was situated mid-way between the pubes and anterior superior spinous process of the ilium; and from it was discharged a great quantity of dark, thick, dirty matter with fætid gas. The right inguinal and iliac regions were full and hard, the hardness and fulness extending upwards and backwards, in the course of the spine of the ilium to the lumbar region, where the skin was red, as if the abscess was pointing in this direction also: the part was so tender that she would not allow any thing to touch it: she felt the belly tight, as if it was going to burst, and hot as if a ball of burning coals was in it. The bowels continued obstinately confined for four days, and then acted, much to the relief of the violent sufferings described.

On the 5th, a second opening was made near the anterior superior spinous process of the ilium, the discharge from which reduced the swelling and inflammation in the lumbar region.

On the 7th, a third opening was made higher up and more posteriorly, through which escaped matter and sloughing muscle and tendon, and sloughs of the same tissues have been drawn out of the first and second openings also. A probe introduced through the first opening, passed more than four inches in the direction of the cæcum. Since the free incisions were made, and the sloughs have come away, the patient has been much easier, and the redness and tumefaction in the lumbar region have disappeared:

and although she is very weak and low, she sleeps tranquilly, her bowels act daily, and the appetite and general health improve. More sloughing tendon two inches long was removed on the 10th. The wounds were now granulating healthily, and from this period all pain ceased, and she regained her strength and health so rapidly as to be able to leave the hospital on the 24th, quite well.

Of the Ulcerative Perforation of the Appendix Vermiformis Cæci, and consequent peritonitis and gangrenous or fæcal abscess.

The appendix vermiformis with which the cæcum is surmounted, is, like the cæcum itself, liable to be the seat of disease, the character of which, however, differs materially, owing to the peculiar conformation and situation of the appendix.

The conformation and situation vary much in different individuals, a fact not noticed by anatomists, but which I have found to influence the phenomena and nature of its diseases very considerably. The conformation of the appendix is generally described as flexuous, and its situation as depending into the pelvis, but by some the situation is not noticed *, further than that the appendix arises from the cæcum and is bound down to it on the right by a fold of peritoneum, the meso-appendix; whereas the appendix is more frequently situated on the outer edge of the psoas magnus on the facia iliaca, snugly curled

* Winslow, Cloquet.

up beneath the cæcum and concealed by it; a fact which I have verified by many dissections, and one of great importance to the pathologist, as will be seen. In the event of a perforative ulceration of the appendix, and a consequent peritonitis or fæcal abscess, the parts involved will differ entirely according to the situation of the appendix. If it should happen to depend into the pelvis, then the pelvic viscera will be implicated; if it should happen to be situated on the iliac fascia and underneath the cæcum, then the belly of the iliacus internus and the neighbouring adipose cellular tissue will be involved, and the course of the abscess be determined accordingly: so important is the relative anatomy of even inconsiderable organs to the physician. In a case to be related where the abscess pointed in the loins, the whole belly of the iliacus internus was in a state of gangrene, as was also the mass of adipose tissue in the lumbar region: the abscess was here making its way to the outer margin of the quadratus lumborum muscle, the part where the parietes offer least resistance to its progress.

The free communication of the appendix with the cæcum by an open mouth, exposes it to the accidental intrusion of small portions of the residuary alimentary matter, or of any other substance which may happen to be passing through the cæcum, and this matter or substance once within the appendix, can only escape by a retrograde course, the appendix being blind or closed at its other extremity. Whether the appendix has the power of expelling any substance from its canal, it is difficult to say; but should the matter or

substance which has accidentally passed into the appendix be large in proportion to the calibre of this gut, it would be impacted and fixed in the canal; would become a source of irritation and of ulceration, perhaps of perforation and all its disastrous consequences. It is far from an uncommon occurrence to meet with small bodies, as raisin-stones, in the appendix, without any mischief having arisen from their presence, because the organic sensibility of its mucous lining, in common with the mucous lining of the intestinal canal, is adapted to the presence of foreign matter. These small bodies may, however, if they remain long, induce ulceration of the mucous membrane, a lesion often found, without producing more inconvenience than is caused by a superficial ulceration of any other part of the alimentary canal; but if a substance larger than the canal of the appendix, as a cherry-stone, or an intestinal concretion, happen to be forced into it and become impacted, then not only does it produce ulceration of the mucous membrane but of all the other tunics until it reaches the peritoneum, which being thus deprived of its means of nutrition, dies, sloughs, then bursts, and a perforation is effected. Now so long as the ulceration is limited to the mucous membrane it is of little consequence, but immediately that the peritoneum is perforated inflammation ensues, for the organic sensibility of the peritoneum will not suffer the presence of any foreign substance. Inflammation therefore is lighted up, and may spread with rapidity over the whole continuous surface of this membrane, constituting an universal peritonitis: or

the inflammation may be limited to the vicinity of the perforation, may be circumscribed and an abscess form: the danger in either case is considerable, indeed the universal peritonitis will prove fatal to a certainty; and so much disturbance both of the constitution and of the functions of the alimentary canal arise from the abscess, as always to endanger, sometimes to destroy life. The abscess may nevertheless come forward, burst, discharge itself and the patient recover; or it may remain circumscribed and stationary, forming a deep-seated painful tumour in the region of the cæcum, which by its proximity to this gut may produce continued obstinate constipation of the large intestines, a sympathetic disturbance of the stomach and of the whole system, and thus gradually wear down and exhaust the unfortunate patient*.

CASE VI.

Sloughing of the extremity of the Appendix Vermiformis Cæci. Circumscribed abscess. Death.

Walking one afternoon with a medical friend, he requested me to call and see a case of a very obscure nature under the care of himself and an hospital physician, which he feared was going on to a fatal termination. The patient, a baronet's coachman, fifty-seven years of age, had become affected three weeks previously with febrile movement, succeeded by vomiting, and by constipation, which re-

* Since writing the above a case has come under my care in which a similar tumour burst into the bowel, discharged itself through this channel, aud the patient recovered perfectly.

quired the use of the strongest cathartics to procure dejections. In the course of the second week he complained of pain in the ilio-inguinal region, for which leeches and a blister had been applied; and about this period there occurred also retention of urine. When I examined him, he was lying on his back in bed, much exhausted, with the tongue beginning to get brown and dry, and the pulse frequent and weak. He vomited frequently, and the bowels were so obstinate that no aperient but croton oil would act upon them. He still laboured under retention of urine, the belly was full and tense, and in examining the region of the cæcum, to which he referred as the seat of pain, I discovered immediately a circumscribed, hard, deep-seated tumour, the size of a small orange, and gave it as my opinion that the disease was situated in the cæcum or appendix. After this he survived not more than eight days, the vomiting, obstinate constipation, pain, and retention of urine having continued to the last.

Sectio cadaveris.—The right inferior portion of the omentum was adherent to the cæcum by fibrine, tender and recently effused: the omentum being carefully detached, there came into view a bag of matter or circumscribed abscess, which was found to be situated between the cæcum and iliacus internus muscle. The whole of the cæcum, as well as part of the colon, and of the cæcal extremity of the ileon were removed and carefully examined, when it was seen that the channel of the bowel was perfect, though the cæcum was contracted, but the appendix was

only one inch long, and terminated openly in the abscess, its blind extremity having sloughed away. It is therefore more than probable that some small substance had become impacted in the appendix and caused an ulcerative perforation and destruction of its blind extremity, followed by a circumscribed inflammation and abscess, of which the precise locality was determined by the situation of the appendix underneath the cæcum, on the outside of the psoas, and upon the iliacus internus muscles.

The immediate contiguity of this abscess to the cæcum was evidently the cause of the obstinate state of the bowels, and of the irritability of the stomach which exhausted and destroyed the patient.

CASE VII.

Ulcerative perforation of the Appendix Vermiformis, from an intestinal concretion. Consequent peritonitis and death.

The subject of this case was a boy twelve years old, under the care of Mr. Wray, from whom I had the following particulars:—The boy was attacked with a deep-seated fixed pain in the right ilio-inguinal region, followed in a short time by febrile movement, vomiting, and a tender and tense state of the whole abdomen, symptoms characteristic of a severe and sudden peritonitis. The inflammation admitted of no relief, its course was exceedingly rapid, and carried off the boy in two or three days. The bowels were readily acted upon by medicine from the commencement of the illness.

Sectio cadaveris. — Layers of recently effused

fibrine were spread over the different parts of the intestines; the peritoneal tunic of which, as also of the abdominal parietes, were very vascular. The appendix vermiformis was found perforated about three quarters of an inch from the cæcum, by an ulcer having an irregular sloughing edge, in which perforation was lodged a concretion about the size of a cherry-stone. The appendix being slit open, another ulcer was discovered in the mucous lining which was vascular, soft and swollen, and the mouths of its mucous follicles were very distinct. In the interior of the cæcum was a portion of its mucous membrane the size of half-a-crown, pulpy and brownish gray; and in the ileum, about half an inch from the valve, was a thickened spongy portion of mucous membrane thickly studded with muciparous follicles, the ducts of which were evident; and the mesenteric glands in the vicinity of the cæcum were enlarged and vascular.

CASE VIII.

Fæcal Abscess in the Right Iliac region. Sloughing of the blind extremity of the appendix vermi formis cæci. Gangrene of the iliacus internus, and of the outer fibres of the psoas magnus muscles and of the sub-peritoneal adipose cellular tissue in the right lumbar region.

Mary Ann Hodges, aged 19, of good frame and stature, was admitted into Guy's Hospital the 10th of January 1828, under the care of the senior physician. Four days previously she was attacked with

severe pain in the right inguinal region, for which she had been bled three times, and leeched and blistered. On admission, being the fifth day of her illness, she complained of great pain and exquisite tenderness in the region of the cæcum, extending upwards to the right hypochondrium: she was vomiting a yellow bilious fluid; the pulse was frequent and small; the skin hot and dry; thirst great; and she lay on the back, inclined to the right side, with the legs drawn up, any change from which position aggravated the pain, and gave it a dragging character.

Twenty leeches to the seat of pain; one grain of calomel and one of opium, every four hours; a castor oil injection. Some slight relief followed the use of the leeches, and the bowels acted several times. Next day, the sixth, twenty more leeches. On the seventh day the pain was unabated, and tenderness continued excessive—tongue glazed at tip—some sordes on the teeth—pulse 112. She was now bled to ten ounces, and ordered to take calomel two grains, opium one grain, tartarized antimony half a grain, every four hours. The pain not having been relieved by the blood-letting, and the pulse having improved, it was repeated in two hours to twenty ounces, after which the pulse became very soft. The night was restless, and on the eighth day the symptoms were not mitigated, and the tenderness and fulness were extending to the left side of the abdomen: she was sick from the antimony. On the ninth day the bowels still acted, but instead of amendment, hiccough came on, and a greater fulness and hardness in the

iliac region was manifest. Blood was again drawn to ten ounces, and the opium and calomel continued. On the tenth day the features were sunk, and the face exsanguine, and now was discovered an obscure fluctuation in the right inguinal and iliac regions, which having become more distinct on the tenth day, an incision of two inches was made through the parietes of the abdomen in the ilio-lumbar region a little above the spine of the ilium, and dissection continued down to the peritoneum, which was near two inches from the surface: a quantity of highly fœtid gas and thin fœtid pus escaped through the opening, and the finger introduced passed into a boggy cavity. The operation was followed by relief to the local sufferings, but the powers of life were exhausted, and death ensued on the following morning.

Sectio cadaveris, five hours after death.—The viscera which came into view on the parietes of the abdomen being partially reflected were healthy, but exsanguious. The parietes of the right side being reflected further, the right inferior portion of the omentum was seen agglutinated to the peritoneum and cæcum; and the agglutinated omentum being detached, discovered a shut cavity filled with offensive dark thick fluid, not of uniform consistence or colour, some portions being of a dingy yellow fæculent character. This fluid, amounting to half a pint, being sponged away, exposed the extent and situation of the cavity, which was in the peritoneum of the right iliac and lumbar regions, walled in by the adhesions of the

omentum, peritoneum, cæcum, colon, and right lobe of the liver. The peritoneum forming the posterior boundary of the cavity was puffed up and black, and being cut through shewed the whole of the loose adipose cellular tissue of the lumbar region in a state of gangrene, the gangrene extending to the same tissue behind the kidney, as also behind the cæcum and ascending colon, and contained some putrid fluid and gas which had puffed up the peritoneum, as seen before it was cut through. The outer portion of the psoas magnus, and the greater part of the iliacus internus was gangrenous also. The colon and cæcum were healthy, but the blind extremity of the appendix vermiformis had sloughed away, the remaining part being pervious and opening into the cavity of the abscess, and containing thin, yellow, fæculent matter, such as was found in the contents of the abscess. The same kind of matter was also in the cæcum. The kidneys normal, as also the viscera of the pelvis. The liver sound, except the margin of the right lobe, which was adherent to the peritoneum.

The muscles of the abdomen in the right iliac and lumbar regions were separated from each other to the extent of a quarter of an inch by soft albuminous matter recently effused, which caused a preternatural thickness of the abdominal parietes, and with the abscess beneath produced the fulness, hardness, and indistinct fluctuations during life. It was through these thickened parietes the incision was made, which had penetrated into the gangrenous mass of adipose

cellular tissue and reached the peritoneum, but had not perforated through it into the abscess.

From the evidence afforded by this dissection, it must be concluded that the sloughing of the appendix, from some cause, had allowed of the escape of the yellow fæculent matter of the cæcum into the peritoneum, which had excited a circumscribed inflammation, walling in the effused matter, and thus producing fæcal abscess; that this abscess caused the gangrene of the psoas and iliacus internus muscles, and of the adipose cellular tissue, and death of the lumbar peritoneum, which from the dense character of its organization had not sloughed or burst. The abscess was making its way to the surface of the body in the ilio-lumbar region, where by the aid of the incision it would have discharged itself as well as all the sloughing tissues, and the patient might have recovered if the powers of life had been equal to the process; but these had been exhausted by the repeated abstractions of blood.

The practical inference, therefore, is, that had the case been understood, and the powers of the patient been husbanded, instead of exhausted by a treatment adapted only to an idiopathic abdominal inflammation, her life might probably have been preserved.

ON

BLACK EXPECTORATION,

AND THE

DEPOSITION OF BLACK MATTER

IN THE

LUNGS,

PARTICULARLY AS OCCURRING IN COAL MINERS, ETC.

By WILLIAM THOMSON, M.D.,

FELLOW OF THE ROYAL COLLEGES OF PHYSICIANS AND SURGEONS OF EDINBURGH.

Communicated by Dr. JAMES CLARK.

The Society are aware that the peculiar form of morbid animal production now so familiarly known to medical men under the name of melanosis, was first particularly pointed out to the attention of the profession, about the beginning of the present century, by the pathological anatomists of Paris. The inquiries that have since been instituted with regard to this singular substance—its relation to other animal productions—and the causes of its characteristic colour, have tended to direct the attention of medical men in an especial manner to various black matters—some of a solid and others of a fluid nature—which

are met with in man and other animals, in the state of health or of disease.

There are obviously three ways in one or other of which the presence, in the texture of any part of the animal frame, of a substance not belonging to its natural constitution may be accounted for. 1st, It may have been separated from the mass of circulating blood by a process of secretion. 2d, It may have been discharged from the blood-vessels either through preternatural ruptures of their coats, or through their natural pores, without having undergone those changes in which secretion consists. And, 3d, It may have been introduced into the body from without, either by natural or by artificial passages. In each of these cases, it is obvious, the substance may either retain the properties it possessed at the time of its being deposited in the situation in which it is found; or have undergone some subsequent change of properties in consequence of its being acted on by the surrounding solids and fluids of the body.

The presence within the body of different kinds of morbid matters of a black colour, has been accounted for on each of these three suppositions—that is to say, these matters have been conceived to be, in some instances, products of secretion; in others, to consist of extravasated blood; and in others, again, of foreign substances introduced into the body from without.

The frequent occurrence of black discolouration of the sputa during life, and the detection of black matter in the lungs and bronchial glands after death, more frequently than in any other parts of the body

of which such matter does not form a constituent element, has led to the suspicion that in many instances these appearances must depend on the intrduction of foreign substances into the respiratory organs by inhalation, and are not referable to either secretion or extravasation. It is the object of this communication, by investigating the circumstances under which black sputa and the deposition of black matter in the pulmonary organs, take place, to endeavour to ascertain in which of the various ways above enumerated these may be produced;—to determine how far the suspicion of their being in some instances of extraneous origin is correct;—how many varieties of black discolouration of the sputa and pulmonary organs ought to to be recognized, whether attributable to external or internal origin;—and how these may be distinguished from one another during life, or on examination after death. I am desirous in particular to call the attention of the profession to the evidence in favour of the extraneous origin of the black matter by which the sputa are liable to be discoloured and the lungs to be infiltrated, which has been supposed to be derived from the occurrence of these affections in persons who, from their occupations, are particularly exposed to the inhalation of carbonaceous powders or gases, such as coal-miners and moulders in iron-works. This is a subject on which for some years past my father and myself have bestowed considerable pains in collecting information; and in the prosecution of which we are still desirous to interest professional gentlemen in different parts of the country.

I shall divide the following paper into three parts. In the first part, I propose to bring together all the individual cases of these affections as occurring in the class of persons to whom I have alluded, which have yet come to our knowledge; and to subjoin some communications relative to them which we have received from gentlemen who have had an opportunity of witnessing them on an extensive scale. In the second part, I shall briefly recapitulate the observations and opinions respecting black sputa and black deposition in the pulmonary organs, to be found in the writings of authors previously to the time at which the class of cases to which I have alluded began to attract attention.

PART I. *Individual Cases and original Communications.*

The cases which we have collected may be referred to two classes, 1st, Those in which the lungs have actually been found infiltrated with black matter on examination after death; and, 2d, those in which from the attendant symptoms, and particularly from the occurrence of black expectoration, there has been reason to believe that such an infiltration had taken place, though an opportunity was not afforded of verifying the suspicion by anatomical examination. The first of these classes may be again subdivided under two heads; 1st, those cases in which there occurred symptoms of pulmonary affection during life, and in which for a longer or shorter period of time, the expectoration was of a black colour; and, 2d,

those in which no mark of pulmonary ailment, or at least no black expectoration had been observed during life, and consequently no suspicion of black infiltration having occurred, was entertained previous to dissection. I shall arrange the following cases in conformity with these divisions.

Of cases of the first description, that is, in which there occurred during life black sputa and other symptoms of pulmonary affection, and in which, after death, black infiltration of the lungs was found to exist, we now know of ten examples, of which nine occurred in persons engaged in coal-mines, and one in a moulder employed at the Carron iron-works.

But before proceeding to detail these cases, I may mention that the first specimen of black lung which I remember to have seen, was taken in 1824-5 from the body of a patient of the Royal Dispensary of this city, who was under the immediate charge of Dr. Probart, now of Bury St. Edmond's. Of the appearances which the lungs presented in that case, Dr. Carswell has given the following account in his article on Melanosis in the Cyclopædia of Practical Medicine *. "The whole of both lungs was perfectly black; in many parts indurated and œdematous; in others softened and excavated. There were no tubercles, nor was there any similar discolouration in

* A drawing of the lungs in this case was made at the time for my father, by Dr. Carswell, and portions of the lungs have been preserved in the Museum of the Royal Medical Society of this place.

any other part of the body." The morbid appearances observed in the lungs were, according to Dr. Carswell, in almost every respect the same as those that are detailed in a case related by Dr. Gregory, which will afterwards be noticed. I am sorry that in consequence of the circumstances mentioned in the following communication with which Dr. Probart has kindly favoured me, it is not in my power to state whether the individual in whom this degeneration occurred, had been by the nature of his employment exposed to the inhalation of carbonaceous gases or powders.

" I regret exceedingly," says Dr. Probart, " that I cannot give you any particulars of the case to which you allude, and a second search after notes of it has proved unsuccessful, for Dr. Carswell also wrote to me upon the subject. I do not think the man had been a miner, or was ever engaged in any occupation of that kind; because had it been so, the circumstance, I suppose, would have been in my recollection. I well remember commencing the dissection, under the expectation of finding emphysema and the other consequences of chronic catarrh, which all the symptoms led me to suppose was the disease under which he laboured. The melanosis was confined to the lungs, but it pervaded them on both sides, and the poor man was at length universally anasarcous."

In the beginning of March, 1826, my father, on his return from a professional visit to East Lothian, informed me that in passing through Tranent, he had been carried to see a man, by occupation a col-

lier, who was discharging by expectoration a large quantity of matter tinged deeply with black. So considerable was the amount of the black matter thus discharged, that my father expressed his conviction that the man's lungs must be in the same state as in Dr. Probart's case, to which I have just referred. The man having died a short time afterwards, I had, through the attention of the late Mr. Hume, surgeon in Tranent, an opportunity of making, along with my brother, Dr. Allen Thomson, an inspection of the body. The following are the notes of the case which I made on my return.

Tranent, 24th March, 1826. —— Drysdale, æt. 43, a collier, has for about four years past been unable to work, except a few days occasionally, on account of great bodily weakness. On the last day on which he worked (viz. in November last) he received a blow with a mass of coal upon the right breast, where a tumour gradually formed, in which fluctuation could be felt. Since December, i. e. for from three to four months, he has been observed to spit a large quantity of a dark-coloured sputum. On the 13th inst. (March) a number of purpurous spots appeared all over his body—one upon the tumour on the breast, which soon afterwards burst by a small aperture in the centre. For two nights previous to death he passed a large quantity of blood by stool. During the course of his illness he has been subject to frequent and copious sweats, but his body is little, if at all emaciated.

Dissection. On cutting into the tumour on the

breast, the pectoral muscle was found destroyed to about a hand-breadth in extent. The tumour was found to contain a quantity of dirty purulent matter. No sinus could be discovered in the parietes of the thorax through which a probe could be passed into its cavity. On opening the chest the lungs on both sides were found to adhere firmly to its parietes. This union was particularly firm under the seat of the external abscess, so that it was necessary, in removing the lungs, to leave a portion of rib adhering to them. The whole of the substance of the lungs was of a deep black colour. In the upper portions, particularly on the right side, they were of a solid texture. In the lower, the cellular structure of the lungs was somewhat preserved. In cutting, two days afterwards, through the portion of lung which had lain below the external abscess, three or four small cavities could be seen, which at that time were filled with an inky fluid. Water dissolved the black matter rapidly—salt water sparingly—whiskey not at all. The mucous membrane of the lower portion of the intestines was lined with a layer of frothy blood, an eighth of an inch in thickness*.

Circumstances which came subsequently to our knowledge, and which will afterwards be noticed, having rendered it desirable to ascertain in what particular department of coal-mining this man had been

* Portions of the lungs, which we brought away, are deposited in the Museum of the Royal College of Surgeons of this place (No. 1438), and a drawing of the chest was executed at the time by my brother.*

engaged, I applied to Mr. George Cunningham, surgeon at Ormistoun, who ascertained from a comrade of Drysdale's that he had been employed at Birslaw colliery, near Tranent, for six years previous to his death, and that in that colliery he worked at the coal-wall; but before he was settled in Tranent he had been employed at Rosewell colliery, near Lasswade, as a stoneworker. Mr. C. inquired of his informer whether Drysdale had a black spit when at Rosewell, to which he replied that he thought he had, but that this was nothing uncommon, as it was caused by the blast of the gunpowder used in their operations.

The above case has never before been published, but the drawings of it and of Dr. Probart's case were exhibited, and the cases referred to, for several successive sessions, by my father and myself, in our lectures on the Practice of Physic. The singularity of the circumstance that in the latter case the affection had occurred in a coal-miner, and the question how far the black condition of the lungs could be supposed to depend on the inhalation of extraneous matter, were especially noticed.

In 1831, a case similar to that of Drysdale occurred in the Royal Infirmary, under the care of the late Dr. James C. Gregory, the details of which were published by him in the 36th Volume of the Edinburgh Medical and Surgical Journal (p. 389), under the title of a "Case of peculiar Black Infiltration of the whole Lungs, resembling Melanosis."

The subject of this case was a man, aged 59, who

had formerly gone through much service as a soldier, but had for the last ten or twelve years of his life been employed in the coal-mines at Dalkeith. It is not stated, nor have I been able to ascertain, in what particular department of the work.

About sixteen months before his admission into the hospital he had first begun to experience palpitations, easily induced, with some dyspnœa and pain along the course of the sternum, which prevented him from following his occupation as a coal-miner. At the time of his admission he complained, in addition to these symptoms, of severe cough, sometimes occurring in paroxysms, with dark-coloured viscid mucous expectoration, which had existed for five months. His breathing was rather frequent; he lay with most ease on the right side, but generally preferred the erect posture. He had slight œdema of the legs, and also of the under part of the arms near the elbows. Five days after his admission into the hospital there were symptoms of an attack of pulmonary inflammation. Shortly after this the œdema began to increase considerably, and his urine was found to become hazy on the application of heat, while its density was lower than natural. The dyspnœa became more urgent, amounting at times to orthopnœa. The sputa became much more copious, and of a peculiar dark grey or nearly black colour, and his tongue acquired a coating of a similar appearance. He died within three weeks after entering the hospital.

"On examination of the body, both lungs," says Dr. Gregory, "and particularly the right, were found

to adhere strongly to the pleura costalis. The pleura pulmonalis of both lungs was much thickened, in some places, especially in the right lung, exhibiting a fibro-cartilaginous appearance and consistence, and about one-fourth of an inch in thickness. The pleura costalis corresponding to this portion of the pleura pulmonalis was ossified, and had caused bony union of several of the ribs. When cut into, both lungs presented one uniform black carbonaceous colour, pervading every part of their substance. The right lung was much disorganized, and exhibited in its upper and middle lobes several large irregular cavities, communicating with one another, and traversed by numerous bands of pulmonary substance and vessels. These cavities contained a good deal of fluid, which, as well as the walls of the cavities, partook of the same black colour. A considerable portion of the pulmonary substance surrounding them was dense, hepatized and friable. The rest of the lung was also somewhat condensed and very œdematous. The serum, when expressed, was of the same black colour as the substance of the lung. The left lung did not appear to contain any cavities, but was condensed and loaded with black serum. Some minute hard points could be felt in various parts of both lungs, but they did not differ at all in colour from the surrounding substance, and no distinct tubercular deposition or infiltration could be detected in those portions of the lungs which were most hepatized, even with the aid of the microscope. The texture in these parts appeared quite uniform, and the minute

hard points felt in other parts rather conveyed the impression of their being merely the ends of small bronchial branches divided on making the section. The bronchial glands did not appear enlarged, but partook of the same black colour as the substance of the lungs." There was slight enlargement of the heart, and some morbid organic changes in the aortic and mitral valves. The structure of the kidneys was altered in the peculiar manner so ably pointed out by Dr. Bright. No other organs presented any black colouration besides the lungs and bronchial glands*.

On conversing with some of the medical practitioners of Fifeshire, who have ample opportunities of being acquainted with the diseases of the coal-miners of that district, my father found that several of them had noticed black spit as frequently occurring in that class of persons, in the progress of fatal pulmonary affections; but from the deep-rooted prejudices against anatomical examinations entertained by the coal-miners, none of these gentlemen had, at that time, had an opportunity of ascertaining after death, the state of the lungs in persons in whom such sputa had occurred. On the 17th March, 1833, however, Mr. Philp, surgeon, of Aberdour, sent him a preparation of black lung, accompanied with the following note.

"I now send you a specimen of the lungs of a man who died of that peculiar form of pulmonary consumption to which miners are liable. There can be no doubt that it is melanosis of the lungs, and

* Portions of the lungs of the subject of this case are in the possession of Dr. Alison.

caused by inhaling the choke-damp of the mines. This individual only laboured under the disease for a twelvemonth, which is a shorter period than usual, and the symptoms were also less characteristic than they commonly are, until towards the close of the disease. I could not get an accurate examination made, and only opened the thorax. The pleura was extensively and strongly adherent; the pericardium contained about six ounces of serum, the heart was small in size, and very pale. The lungs on both sides were found to have lost their elasticity, and to be converted into the consistence of liver, and of a deep jet black colour; the right lung was rather blacker than the left, and the blackness in both deeper at the superior than at the inferior parts. The right lung at the upper part contained a cavity capable of holding a middle-sized orange, lined with and containing liquefied melanotic matter, similar to that which was expectorated during life, and of which the expectoration during the latter periods of the disease generally consists."*

In a second case, in which Mr. Philp had an opportunity of examining the body after death, the patient laboured under symptoms of chronic bronchitis, together with those of black lungs, and the bronchitic affection, he conceives, modified the symptoms and hastened the fatal event, as the patient was only five months under the last stage of the disease; the symptoms, towards the termination of the case, being

* See preparation in the Museum of the Royal College of Surgeons, No. 1439.

more those of chronic bronchitis than of black lung. In this case there was more scanty expectoration of black matter than is usual in the disease.

Dissection.—Thorax.—There existed very strong adhesions of the pleura pulmonalis to the pleura costalis; and considerable effusion of serum into the cavity of the chest. The lymphatic glands attached to the internal surface of the sternum, were all converted into melanotic matter. The whole substance of the lungs was converted into the same structure, and was hard and inelastic. No cavities could be discovered on making different sections of the lungs. There were several enlarged air-cells. Effusion had taken place into the cavity of the pericardium, and the heart was in a state of hypertrophy, but otherwise unaltered in structure.

Abdomen.—Considerable effusion of serum into this cavity had taken place. The stomach, liver, and intestines were natural. The mesentery and its glands were of a greyish-blue colour, and seemed to be partly converted into melanotic structure *.

In a subsequent communication, of date 6th October 1834, Mr. Philp referred to the case of a man about 40 years of age, who had been under treatment from August 1833, and in whom the disease had made considerable progress. Under the treatment pursued, however, the black spit had vanished, he had got quit of his cough, and although invalided from the debility in his breathing, he was

* See preparation in the Museum of the Royal College of Surgeons.

without any urgent complaint, and the progress of the disease seemed checked. This individual died in January, 1836, and Mr. Philp had an opportunity of examining the state of the thorax. On raising the sternum, the pleura pulmonalis was found to adhere very strongly both to the ribs and the sternum. The pericardium was thickened and distended with a pound and a half of brownish coloured serum. A thick layer of coagulable lymph was deposited on the outer surface of the heart, from which adhering bands stretched to the pericardial sac. The size of the heart was natural, and its structure natural, but its texture was soft. The left lung was much compressed, and throughout of a melanotic structure, with here and there a tubercle. The right lung was a complete mass of the disease, and contained a cavity of the size of an orange filled with liquefied melanotic matter *.

Being desirous to ascertain whether this affection was known to occur among the coal-miners of the west of Scotland, my father, in the spring of 1833, drew up a series of queries on the subject which he transmitted to his friend, Dr. Cumin, Professor of Midwifery in the University of Glasgow, by whom they were circulated among his medical acquaintances in charge of coal-miners. Dr. Cumin, however, could obtain no information regarding the affection except from Dr. Marshall, of Cambuslang. That gentleman subsequently published in the Number of the Lancet for

* A portion of the right lung which Mr. Philp had the kindness to transmit, we have placed in the hands of Dr. Christison for chemical analysis.

17th May, 1834, a paper entitled "Cases of Spurious Melanosis of the Lungs; or of Phthisis Melanotica." In this paper he relates two cases of the kind occurring in coal-miners, in which he had had an opportunity of ascertaining, by dissection, that the lungs had undergone the black degeneration. These cases I shall take the liberty to introduce here.

John Cowan, æt. 58, a coal-miner from his boyhood, is of temperate habits, and has enjoyed good health until within these last seven years, during which period he has had cough, with occasional attacks of dyspnœa, these symptoms being generally aggravated during winter; but latterly his cough had increased in severity, and his expectoration had become purulent. He had lost flesh and strength, and, in a word, presented all the symptoms of a person labouring under phthisis. In March, 1831, he was compelled by the state of his complaints to abandon working in the mine, but he continued to do light work above ground until the succeeding December, when his increasing debility obliged him to confine himself, and Dr. Marshall's regular attendance upon him became necessary. His expectoration at this time was very profuse, and presented, when agitated with water, the characters of pus mixed with mucus. These characters it retained until February, 1833, when it assumed the deepest black colour; a quantity of it collected on a glass presenting a closer resemblance to printers' ink than to anything with which it could be compared. The quantity of this black matter which was spat up was immense, amounting occasionally to two English

pints in the twenty-four hours: at other times it was much less profuse, and he was then harassed by a constant hawking, occasioned by a feeling as if some tenacious mucous were lodged in the wind-pipe.

His symptoms after this period were such as characterize every fatal disease of the lungs. He had, however, occasional attacks of burning pain in the left side, likened to the application of a hot iron; there was very slight œdema; his pulse was little above the natural standard throughout the whole course of the disease; and his appetite was good until his death, which occurred in June 1833, apparently hastened by an attack of diarrhœa.

Post-mortem examination. On opening the thorax, the glands under the sternum were observed to be of a black colour. Both lungs adhered generally and strongly to the pleura costalis; the pleura pulmonalis of both lungs, especially of the left, was much thickened, exhibiting, when cut into, a fibro-cartilaginous consistence and appearance. The substance of both lungs exhibited throughout an uniform coal-black colour, not a vestige of the natural colour of the lung being observable. The left lung was entirely disorganized, both lobes being converted into one large irregular cavern, traversed by numerous bands of pulmonary substance. At one part the substance of the lung was entirely destroyed, and the wall of the cavern was formed by the pleura alone. The bronchiæ communicated with this excavation with abrupt and open mouths, and the pulmonary substance around their roots was dense, friable and at

some points like cartilage. The right lung presented throughout numerous irregular excavations of various sizes, communicating with each other, and traversed by shreds of disorganized lung. Around these excavations there was pretty general hepatization, the respirable portion of the lung bearing a very small proportion to its entire volume. The excavations in both lungs contained a considerable quantity of inky fluid, similar to the expectoration during life; and indeed all the fluids which were expressed from the lungs were of the same deep black colour. With the exception of effusion into the pericardium, no other unhealthy appearance was observed.

This patient referred the commencement of his disease to a period when he had wrought for some time in a coal-mine, the atmosphere of which was almost irrespirable.

David Dunn, æt. 62, a collier from boyhood, has been affected for many years with chronic rheumatism, and has likewise had occasional attacks of difficulty of breathing, which have been especially severe during cold or changeable weather. He was originally of a robust constitution, but has been latterly rather of intemperate habits. In January 1833 he was attacked with cough accompanied by palpitation and occasional dyspnœa; he continued, however, at his employment till June, when his symptoms became so far aggravated as to compel him to put himself under treatment. He dated his complaints from a period, fifteen years back, when he wrought for several

months in a mine the atmosphere of which was exceedingly impure.

A quantity of his expectoration being collected, was found to present a dark grey or nearly black colour, like mucus mixed up with lamp-black. His symptoms from this period until his death in January 1834, were such as are seen in every case of phthisis. The pulse, however, was never much quicker than natural; there was no œdema, and his appetite continued good till death.

Post-mortem examination. The glands under the sternum were filled with black matter. The left lung adhered throughout its whole surface to the pleura costalis; it was converted into one large irregular cavern, containing an immense quantity of inky fluid; the substance of the lung had contracted numerous old adhesions to the pleura; its substance was throughout deeply stained with the black infiltration, but the greater portion of it inferiorly was respirable, and floated in water, and the serum or mucus which could be expressed from this portion was untinged. In the upper part of the lung, however, several portions of its substance were hepatized, and a section of these portions shewed commencing excavation in various stages of progress; the largest cavity, however, did not exceed the size of a nutshell. The contents of the bronchia in the neighbourhood of these excavations, were remarked to be tinged with the black matter. The other organs were healthy.

Inquiries having been instituted by our friend Dr. James Y. Simpson, among the medical practitioners of West Lothian, as to whether they have had an opportunity of observing this affection, he was assured that it is not known either among the practitioners or the miners of that district. During the progress of his inquiries, however, a case was discovered in the person of the superintendent of the Collinshiel colliery, near Bathgate, who had formerly worked in a coal-mine in Mid Lothian. This case eventually proved fatal, and a post-mortem examination was obtained. I am indebted to Dr. Simpson for the following very circumstantial history of the case.

"May 1st, 1833. To-day I visited at Collinshiel colliery, along with Mr. Dixon, surgeon, Bathgate, George Hogg, a man, 40 years of age, tall and of a very athletic form. At present, and for nine or ten months past, this individual has been unable to follow any active employment. He labours under a continual slight dyspnœa, which does not prevent him from taking gentle exercise, but it is always aggravated to a great degree by any considerable exertion. His breathing, even when he is at rest, is somewhat laborious and sonorous. He has frequent cough with expectoration. The matter expectorated is at present generally tinged more or less of a dark colour, but it is only at times that this is particularly well marked. For instance, about eight days ago, when attempting some slight work in his garden, he suddenly coughed up two or three profuse sputa, the

matter of which he could compare, he says, to nothing but *black ink*. There does not appear to be any distinct hectic fever, and the symptoms altogether approach, perhaps, more to those of asthma or of chronic mucous catarrh, than to those of tubercular phthisis.

"Hogg's present situation is superintendant of the workmen at the colliery. He has not himself worked below ground for three years past; but previously to that period he was employed at Pencaitland colliery, near Tranent, as a coal-setter, or in removing the strata of sandstone, and the beds and veins of secondary trap and other rocks of the mine that impeded the free working of the coal seams; an operation which constantly required the aid of gunpowder, and consequently kept those engaged in it breathing a confined atmosphere, loaded with vapours containing a large quantity of carbon. He had, unremittingly, followed this occupation for many years, and some of the coal-setters that worked in the same mines as himself, have, to his knowledge, died after labouring under catarrh of a more or less chronic character with black expectoration.

"April 29th, 1834. Having to-day heard of Hogg's death, I obtained permission of the relatives to inspect the chest, a task in which I was assisted by Mr. Dixon.

"I learned that after I saw the patient last summer, the black expectoration remitted for some time. It again became darker in colour, as well as more

copious in quantity towards the middle of winter, especially about the month of January. From that time, also, the dyspnœa and debility gradually increased. Latterly, the peculiar black expectoration appears to have been very profuse. About three weeks before his death, he collected and measured the whole quantity which he spat up during the course of a single day. It amounted to about a Scotch mutchkin, or nearly fifteen fluid ounces. Altogether Hogg had laboured under pulmonary symptoms for about twenty-two months, and the black expectoration first distinctly appeared about fourteen weeks before his death. He had remained free from any marked pulmonary complaint, for more than two years after he had finally given up working in the mines.

"Inspection of the body ninety-six hours after death. —The cartilages of the ribs were much firmer than natural, but not ossified. On raising the sternum the lungs were seen projecting forwards, and appeared to fill completely the cavities of the chest. Their external surface presented a black or rather blue-black colour. In the left cavity of the pleura there was a considerable quantity of a reddish serous effusion, and the lower lobe of the lung adhered intimately to the corresponding surface of the diaphragm. The right lung was extensively, indeed almost universally adherent to the costal pleura. Judging from the strength of these pleuritic adhesions, and from the difficulty with which they were torn, they appeared to be of an old date.

When the lungs were examined, after being removed from the chest, the upper lobes were found to present the usual characters of pulmonary œdema in a very considerable degree. Their external surface, particularly that of the left lung, felt in numerous points rough and a little elevated by defined deposits of a solid matter beneath the pleura, in the form of compact masses or nodules, roundish, oblong, variously irregular in their figure, at some points isolated, and at others more or less agglomerated, and varying from the size of a hemp-seed to that of a cherry-stone, or larger. Similar masses existed in the centre or substance of the same lobes, and gave to the fingers an impression exactly like that conveyed by the presence of tubercles in the pulmonary tissue. On a section being made into the upper lobes, their substance was seen to present a deep and uniform black colour throughout, and a quantity of serum of the same colour flowed from the cut surface. On washing a portion of one of these lobes repeatedly in cold water, the deepness of the inky-black colour of the proper, and still in part crepitant pulmonary texture, was considerably lessened, though that of the solid tubercle-like masses above alluded to remained as intense as ever. The section of these masses shewed them to be of an intensely deep black colour interiorly.

" At one part of the surface of the upper lobe of the left lung, and immediately connected with and covered by a portion of corresponding, thickened, and almost cartilaginous pleura, the substance of the

lung, for about an inch in extent and a quarter or half an inch in breadth and depth, seemed transformed into a mass, the section of which very much resembled, both in point of density and colour, the section of a piece of compact black caoutchouc; and from this mass there passed off several firm linear prolongations into the substance of the surrounding lung. The lower lobe of this same lung (the left) seemed unusually large, and felt, before it was divided, as firm as a portion of lung in the second stage of inflammation. At one part, where its investing pleura was, for about the extent of a crown piece, preternaturally thickened, the pulmonary substance lying immediately beneath it was still more compact than the rest of the lobe. The internal structure of the whole lobe appeared, on a section being made of it, of a deep, somewhat bluish-black colour; throughout some parts of it were very friable, and others even pulpy and fluid. These parts were removed when the lung was gently washed in water, and left irregular anfractuous cavities of different sizes; some of them very large, and having their walls formed of shreddy disintegrated pulmonary tissue and vessels, which projected into, and in two or three instances ran quite across the cavities. These vessels and the pulmonary parenchyma seemed both equally black. The tissues of the smaller bronchi of this lobe, and, indeed, throughout both lungs, partook of the general black colouring; but their larger branches, as well as the larger branches of the blood-vessels, nearly preserved their

usual appearance, and were the only parts, with the exception of the two thickened portions of pleura already alluded to, and a part of the lower lobe of the right lung, to which I shall presently refer, that had escaped the general black discolouration.

"The lower lobe of the right lung seemed still larger and more distended, and had its angles still more rounded off than the corresponding lobe of the left lung. Externally it presented the same black appearance, and it felt extremely firm and solid. I was surprised, therefore, on dividing it with the scalpel to find the greater part of it consisting not of a solid structure but of a number of cells, divided from one another by partitions of a firm and compact structure, and of a greyish or straw-coloured appearance, interspersed with points and small patches of black matter. The idea which suggested itself to me, on the hurried examination of this lobe at the time of dissection, was, that the appearance in question might have been produced by the occurrence of chronic inflammation in the parenchymatous substance of a portion of lung previously affected with vesicular emphysema—this inflammation having run on to the stage of grey indurated hepatization. The morbid appearances, which a large portion of the lower lobe of the right lung thus presented, gradually passed in the remaining and upper portion of this lobe into a compact black tissue, similar to that of the lower lobe of the left lung, and, like it, it contained some irregular excavations filled with a black pulp and fluid.

"The heart was flabby, and the muscular substance forming its walls soft and bloodless, and almost without any red tint. Its cavities did not contain any coagula of blood; its different valves and orifices appeared to be healthy."*

In the month of July, 1835, Dr. Simpson had an opportunity of seeing a second case of this disease, occurring in a coal-miner at the village of Redding in Stirlingshire.

"The patient was under the professional care of Mr. Graham of Polmont, and I visited him along with that gentleman and Mr. Girdwood of Falkirk. The following was the history and state of the patient as I found him at that time.

"Robert Leishman, æt. 60, the father of a numerous and healthy family, had been employed as a coal-miner from very early life, principally in the coal-pits belonging to the Carron Company. He had sometimes worked at the coal-wall itself, and at other times been engaged at setter-work, or in removing the other rocks of the mine, an operation in which he constantly employed gunpowder. Though capable of taking a considerable degree of easy exercise on foot, and to external appearance rather a hale-looking old man, he has been perfectly unable to work in the pits, or at any employment above ground for five years past, on account of 'great want of breath.' For four or five years previously to his giving up work, he had suffered much from this dyspnœa, especially on going

* See preparations in the Museum of the Royal College of Surgeons, Nos. 1440, 1441, and 1442.

to the pit in the morning, the road being up-hill. He had also, at that time, been very subject to headaches. For a long period he has been troubled with a cough and expectoration, and about five weeks ago he suddenly began to spit up large quantities of a perfectly black matter, on which occasion Mr. Graham was called to him under the belief, on the part of his relatives, that he was spitting blood. He continued to expectorate this black matter, in quantities amounting to nearly eight fluid ounces daily, until about a week ago, or altogether for a period of four weeks, when this species of expectoration ceased as suddenly as it had begun. He never at any period of his illness experienced a fit of dyspnœa in the night-time, or when at rest. He has a considerable degree of the stoop or rounded curvature of the back which is so frequently seen in old asthmatics, and his sternum and ribs are projected forwards in the manner in which they are usually seen to be in such individuals."

The patient continued in nearly the same state in which I saw him in July up to the middle of August, when the black expectoration again appeared and continued for three weeks, at an average quantity of four ounces daily. In September he suffered a severe attack of acute dysentery, which was very prevalent at that time in the village in which he resided, and he sank under this disease in the course of ten or twelve days.

Mr. Graham has further informed me in regard to the history of Leishman's case, that before his expectoration first became black in June, and during the pe-

riod between that and the second similar attack of black expectoration in August, his sputum was white and frothy, without smell, and scarcely such as to be at any time called purulent. Mr. Graham also states, that Leishman never had the profuse perspirations, nor the ordinary hectic of a phthisical patient, and œdema of the legs was never observed, except in a very trivial degree.

September 20th.—Examination of the body about sixty hours after death. The body was not much emaciated. The cartilages of the ribs were unossified. Numerous and strong bands of false membrane united the opposite surfaces of the pleuræ. In both lungs, the bands of false membrane forming these adhesions were perfectly black, and on examining the internal surface of the uplifted sternum, a number of deep-black roundish or oval-shaped flattened bodies or patches, of three or four lines in diameter, were seen running irregularly parallel to its sides. Most of these roundish bodies or patches appeared to correspond to the points of insertion of the black-coloured bands of false membrane, but others of them were, as Mr. Girdwood particularly pointed out to me in one instance, distinctly seated beneath the pleura, at a point where that membrane was perfectly healthy. I regret extremely, that in the hurry in which the dissection was conducted, I did not inspect these bodies more narrowly, or procure a specimen of them for more minute examination afterwards. From since looking, however, at the description and delineations by Mascagni and

Cloquet, of the lymphatic glands, which run irregularly along the anterior parietes of the chest, in the course of the internal mammary arteries, I am myself convinced that the bodies alluded to consisted of these glands infiltrated with black matter. At least, their general situation, appearance, and outline corresponded very exactly with those of these glands. Except in the situation of these black bodies, and of the adherent portions of black false membrane, the pleura lining the sternum and anterior parietes of the chest, was of a white and perfectly healthy aspect. On each side of the chest there was an effusion amounting to four or five ounces.

On removing the two lungs from the chest, they were seen to present, over their whole surface, a general deep or dark blue colour. The surfaces of both lungs were very rugged and uneven, from irregular superficial puckerings at some parts, and small and apparently emphysematous elevations at others. Both their lower lobes were extremely emphysematous, some of the emphysematous cells being as large as walnuts. The walls of some of the largest of these bullæ, shewed the black matter only in lines or striæ, and not in continuous patches or layers. The substance of both lungs, when cut, presented throughout an intensely deep black hue, and contained a considerable quantity of serum of the same colour. The black colour of the pulmonary structure was not in any degree removeable by washing or compression, and stained every thing that was brought in contact with it. The upper lobes of the two lungs, and

some portions of the other lobes, though considerably œdematous, were crepitant, elastic, and light enough to float in water. Several portions of greater or less extent in the lower lobes were converted into a compact, indurated but always deep black structure, and at one or two points in the middle and lower lobes of the right, and in the upper part of the lower lobe of the left lung, these solidified portions were very friable, and had broken down into irregular excavations, traversed by shreds or bands of the disintegrated pulmonary structure, and filled with a substance like thick liquid blacking, or a very strong solution of China-ink. Throughout the whole substance of both lungs, except at the points where the structure of the organ was generally solidified, a number of small, firm, scattered knots or granules, like miliary tubercles, could be felt and seen.

The coats of all the smaller pulmonary blood-vessels and bronchial ramifications partook of the general black colouration; but the larger had more or less completely escaped it in proportion to their size. The bronchial glands were of the same deep black colour as the lungs, but not enlarged in any marked degree. The free and attached edges of the semi-lunar valves of the aorta were the seat of slight cartilaginous degeneration *.

The last case belonging to this series, which I have to mention, is one that occurred in a man, forty-eight years of age, who had been employed for forty years

* Dr. Simpson has sent a portion of lung from this individual, to Dr. Hodgkin, to be deposited in the Museum of Guy's Hospital.

by the Carron Iron Company, as a moulder, and which has been related by Dr. G. Hamilton, of Falkirk, in the 42d volume of the Edinburgh Medical and Surgical Journal, p. 297, as a "Case of Melanotic Infiltration of the Lungs, with old and recent Pleuritis."

This person, who was of rather dissipated habits, came under Dr. Hamilton's care about the end of December, 1833. At that period, he stated that his health had been for some time declining, and that latterly he had become so weak as to be incapable of following his ordinary employment. His legs were observed to be considerably swollen, and the action of the heart greater than natural; his respiration, however, was nearly natural, but he had some cough. These symptoms were somewhat relieved by the use of digitalis, diuretics, and purgatives. In the beginning of May this patient appeared to be gradually losing strength, but was not confined to bed, and he continued in nearly the same state till May 20th, when he was seized with violent pain on the left side, and great breathlessness, and expired the following morning. He had not sweated immoderately during his illness, and his sputa, until within a few days of his death, were of a bluish colour; they were at that period reported by his attendants to have become perfectly black, as if they had been mixed with a quantity of soot.

Inspection.—Upon opening the chest, the upper lobes of the lungs were found strongly attached to the pleura costalis. Upon the pleura of the left lower

lobe there was some apparently recently effused coagulable lymph. When pressed with the hand, a large portion of the pulmonary tissue seemed tolerably crepitating, interspersed, however, in all the lobes, with indurated portions. On cutting into the lung, it presented universally an intensely black colour, exactly as if it had been infiltrated with soot or finely powdered charcoal. This black colouring matter pervaded every part of the lung, but appeared to be collected into particularly dense masses in the portions above mentioned, which had become indurated. Nothing like tubercular matter was found. The heart was very little enlarged, and nearly in a normal state. A small cyst was found in one of the kidneys; but, excepting this, the abdominal viscera seemed to be very healthy. The brain was not examined.

The second class of cases which I have to mention are those in which the lungs have been found, on examination after death, to be infiltrated with black matter, though no marks of pulmonary affection had occurred during life, or at least there had been no discharge of black sputa. Six cases of this kind have come to our knowledge.

Three of these are related in an essay, "On the existence of Charcoal in the Lungs," by Mr. Graham, lecturer on chemistry in the Andersonian University of Glasgow, to which are appended, "Observations on Spurious Melanosis," by Dr. Wm. Craig, published in the forty-second volume of the Edinburgh Medical and Surgical Journal, p. 323. In these cases, this

state of the lungs was found to exist in colliers, whose death had been occasioned by accidents, and who, during life, were robust and healthy, had no cough nor expectoration of black matter, nor exhibited any symptom of pectoral affection.

The first was communicated to Mr. Graham by Dr. Laurie. The patient had received a compound fracture laying open the left knee-joint, and fracture of the clavicle, scapula, and some of the ribs of the same side, by a mass of coal falling on him. The leg was immediately amputated, and the patient was doing well till the fifth morning after the accident, when he was suddenly seized with a very acute pain on the left side of the chest, confined to a small spot in the situation of the fractured ribs, and accompanied by a severe rigour, for which he was bled, &c.; but he sank rapidly and died four hours afterwards.

Inspection of the Thorax.—A few ounces of bloody serous fluid and some adherent lymph were found on each side of the chest. The pleura costalis was ruptured, the lung not torn. The pulmonary tissue was very black, and afforded the black colouring matter with great facility when cut down and pressed in water. It appeared, however, sound, and to have suffered no change of structure.

The second and third cases were communicated to Mr. Graham, by Dr. M. S. Buchanan. Dr. B.'s first patient, a man, aged 40, from Polmadie, two miles from Glasgow, died four days after a dreadful fracture of the pelvis. On both sides of the lungs was every where remarked the carbonaceous deposit, denomi-

ed by Dr. Carswell "spurious melanosis." The ond patient, an engineer, from Garnkirk, aged 29, esented precisely the same appearances, but with e addition of some stratiform melanosis in the eritoneum.

In a communication with which I have been avoured by Mr. McConechy, he mentions another ase of black lung, in which no symptom had occurred during life leading to a suspicion of its existence. "In the beginning of June, 1833, a young man, about twenty years of age, who had been all his life a collier, died in the infirmary of Glasgow, of pericarditis. I did not see him during his illness, but I am informed that he never had any symptoms of pulmonary disease, except such as were induced, during the last few days of his life, from œdema of the lungs, consequent on the disordered action of the heart. When in the hospital, he laboured under acute rheumatism, and his death was caused by the translation of the rheumatic inflammation from the extremities to the central organ of the circulation. On inspection, the lungs were found to be black, and through the kindness of Mr. Howie, house-surgeon, they were sent to me. They presented the following appearances:—Though œdematous, they were still crepitant, elastic, and lighter than water. Their complexion was a very deep bluish black, but this colour was not of uniform intensity. I would say, that the whole texture of the lungs was more or less dyed with the black matter; but the correct statement is, that they had a morbid appearance, the black matter having been

deposited in patches or spots, from the size of a pin-point to that of a well sized pea. There was no disease of the lungs that I could discover, which could in any material degree interfere with their functions, except the accidental infiltration. The air-tubes, as far as anatomical inspection could detect, were perfectly patent, and retained the white glistening look of a fibrous tissue, in the midst of the surrounding black mass. The pleura pulmonalis was not in the least degree affected by the black matter, as was obvious when a portion of lung was put into a filtered solution of chloride of lime, to which a little nitric acid was added, for it was then detached from the surface of the lungs of a pure white colour."

Dr. Marshall, of Cambuslang, in a letter of date the 10th of December, 1835, which I have received from him, says, "I have not of late had any additional opportunities of observing this disease, with the exception that on the inspection of a collier, aged 35, who had died of scirrhous contraction of the lower intestine, the black infiltration of the lung was discovered in what I presume to be its early stage—that in which the substance of the lung, though charged with the black matter, is still crepitous and respirable. In this individual, affection of the chest had not been suspected during life."

Mr. Dawson, of Bathgate, in a letter to Dr. Simpson, 5th of November, 1835,) mentions the case of a man of the name of Latta, aged 40, who had worked latterly at Mr. Wier's colliery,

but whose previous history was not known. He was attended for about two years by Mr. Dickson, surgeon in Bathgate, on account of symptoms of severe asthma, attended with violent palpitation of the heart and with cough, but without any peculiarity in the expectoration, either as regards its quantity or quality. He never had any black sputum during life. On examination after death, the lungs were found as black as soot. There was no thickening or enlargement or other disease of the parietes of the heart, but the valves were completely ossified*.

Before concluding the detail of cases in which the lungs have been found, on examination after death, infiltrated with black matter, I may mention that my father, when on the continent, in the summer and autumn of 1833, learned from Professor Schoenlein, formerly of Wurzburg and now of Zurich, that he had seen several cases of the black infiltration of the lungs occurring in miners, both at Wurzburg and at Zurich, and was satisfied that, in some instances at least, the disease had appeared in persons belonging to mines in which no gunpowder was used.

* Mr. Dawson, in the same communication, refers to the case of W. Hynd, collier, æt. 21, employed at Collinshiels. Had worked coal all his life. For many years had severe coughs, and expectorated a viscid yellow matter, which Mr. Dickson thinks was rather mucus than pus. For two or three days before his death he expectorated a small quantity of black spittle, some of which was very black, at other times mixed. On inspection after death, the lungs were only partially black, with some ulceration, &c.

The third class of cases which I have to mention, comprehends those in which black sputa have been observed during life, but in which there has not been an opportunity of examining the state of the lungs after death. Besides individual cases, I shall, under this head, introduce several communications of great interest, with which we have been favoured by medical gentlemen practising in different districts of Scotland, and which contain the general results of their observations on this affection.

First, as regards the mining district of Lanarkshire. Dr. Marshall, of Cambuslang, in the essay formerly referred to, mentions that some time previous to his having had an opportunity of ascertaining the nature of this disease by dissection, two cases came under his care, which he now regards as examples of melanotic phthisis. The first occurred in 1825; the patient had been a coal-heaver the greater part of his life. He had been labouring under chronic rheumatism for some years, and had occasional attacks of cough, difficulty of breathing, and palpitation. He attributed the commencement of his ailments to having worked for some time in a very impure atmosphere. In June, his debility had increased so much as to confine him totally to his house; and along with this there was great emaciation, with aggravation of the cough and dyspnœa, and his expectoration now assumed a dark inky colour, which became deepened as his disease advanced. In September, he was reduced almost to a skeleton, and the black expectoration had become

very profuse. At this time he was removed to another part of the country, where he died shortly afterwards.

The second of these cases came under Dr. Marshall's care, in September, 1827. "The patient, a collier from boyhood, likewise referred his complaints to working in an impure atmosphere. He had been troubled with cough and dyspnœa for five years; at this time his dyspnœa was increased. There was great emaciation and debility; his pulse, however, was little accelerated, and his appetite was good. His expectoration consisted of dark ink-coloured mucus in considerable quantity: it had assumed this appearance a few weeks before this period. Latterly, slight œdema of the legs made its appearance, and an attack of diarrhœa, which continued two weeks, cut him off in December, 1827."*

* In reply to queries, which I addressed to Dr. Marshall, relative to the kind of employment of the persons affected with this disease, who had fallen under his observation, he has done me the favour to communicate the following particulars. "In the first place, the use of gunpowder is strictly prohibited in the pits here, excepting in getting through stone, a work not entrusted to the regular colliers. Second, one of the individuals had wrought at stone work in driving a level, but not for a great length of time previous to the obvious development of the affection; and third, this same individual, while employed as above mentioned, was in a pit charged with a most impure atmosphere. I may remark, in conclusion," adds Dr. Marshall, "that after weighing all the circumstances connected with the cases I have seen, I still regard the deposition of the coal itself in the lungs as the cause of the disease."

I had an opportunity in the autumn of 1835, to make personal inquiries of some of the medical practitioners of Airdrie and the neighbourhood, as to whether any cases of black expectoration or black lung had fallen under their observation. The only case of the kind respecting which I was able to obtain any precise information was the following one, which has been communicated to me by Mr. Wilson, surgeon.

Francis Black, aged 47, had been employed from his youth in working in a free-stone mine in Fifeshire, till within a few years of his death. After leaving Fifeshire and coming to this part of the country he was engaged for three years and a half as a coal-miner. Till about the end of this time he enjoyed excellent health in every respect, but for three years subsequently, he suffered greatly under a very severe attack of sciatica, which reduced him very much, and continued to harass him as long as he lived. About a year before his death, symptoms of pectoral affection for the first time made their appearance. These he attributed to his having caught cold by being carried by his friends one evening to the door. From that time the cough never left him; the sputa before long assumed a bluish appearance, and they grew gradually darker in colour, so that for some time before his death they were jet-black. Except in the nature of the sputa, the case in all other respects resembled one of phthisis pulmonalis. Permission was not obtained to inspect the body after death.

The next communications which I have to submit to the Society relate to the mining district of Fifeshire. The first of these was addressed to my father by his esteemed pupil and friend, the late Dr. James Stenhouse, of Dunfermline, of date 25th March, 1833.

"I have seen several of the old colliers at Bevylaw die after long continued expectoration of the black mucus; but I regret that I had not an opportunity of examining the lungs after death. I will certainly embrace the first opportunity that offers. One well marked case occurred a few months ago in a middle aged man, who ultimately recovered perfectly from a state resembling hopeless consumption. He was ill about three months, and during that time spat up an immense quantity of mucus as if tinged with coal-coom."

The following communication from Dr. Dewar, also of Dunfermline, and of the same date as the above, opened up a view of the circumstances in which this affection of the pulmonary organs is produced, of great interest and importance. It will afterwards be seen, that other practitioners are not disposed to concur in the view which that gentleman has taken of the etiology of the affection; but the very extensive series of observations on which his opinion is founded, as well as Dr. Dewar's well known intelligence and accuracy, entitle it to the most respectful consideration.

"The facts which I am now to state have passed under my own observation during the last ten years, at the colliery of Hallbeath. Since I saw you, I have revived my recollection by inquiries on the spot at the

relations of the persons of whom I have to speak, and by reference to some scanty notes which I have accidentally preserved.

"You will please to observe the distinction between colliers and stone-workers. The former are employed merely at the coal-wall, and use only picks and wedges at their work; while the stone-workers are occupied, in whole or in part, in removing the free-stone and other rubbish which separate the different layers of coal. In these latter operations, the aid of gunpowder is constantly required, and the workmen, from the very imperfect state of the ventilation, are frequently enveloped in dense smoke. The persons who are exposed to this noxious atmosphere are, so far as my experience goes, the victims of this most fatal species of disease in the lungs, viz., consumption with black spitting.

"1. Four brothers, of the name of Smith, died with black spitting; all of them were stone-workers. Four sisters, of the same family, who have worked regularly in the coal-pit, are all in good health.

"2. Four men, of the name of Bowman, died with black spitting; all of them stone-workers. Three brothers and four sisters, of the same family, who have worked in the pit, but not at stone-work, are all well. One sister died of consumption, the wife of one of the Smiths, but she had no black spitting. She died before her husband.

"3. Two men, of the name of Brown, died with black spitting; both stone-workers. Three sisters, who have worked in the pit, are well.

"4. Two Wilsons, stone-workers, died with black spitting. Three sisters, workers in the pit, well.

"5. Four Campbells, stone-workers, died with black spitting. Three sisters and four sons, workers in the pit, well.

"6. Williamson, a stone-worker, died with black spitting. Two brothers and one sister, pit-workers, well.

"7. Black, a stone-worker, died with black spitting. Three sons and four daughters, workers in the pit, well.

"8. Three Simpsons, stone-workers, died with black spitting. One son, a stone-worker, now dying with it. Two other sons and four daughters, pit-workers, all well.

"9. Three Duncans, brothers. James, a stone-worker, died of the disease. Archibald, a stone-worker, now labouring under a cough with black spitting; and John, a collier, an old broken-down man, with a cough and difficulty of breathing, but no black spitting.

"Such are the facts. The conclusion, so far as they go, is obvious. I shall be glad to give you any farther information I can."

In a second communication from Dr. Dewar, dated Dunfermline, the 2d of September, 1834, he says:

"I regret that I have no new facts to add to those I formerly sent respecting the disease of the chest accompanied with black spitting. My connexion with the colliery ceased very soon after the period of my last communication, and in consequence my

opportunity of observation has since been very limited.

"1st. In answer to your first question *, the facts I have observed are as follows. Twenty-two persons, all stone-workers, have died of the disease, while forty-one persons of the same families, who are accustomed to work in the pit, are in good health. I should think that those who have suffered from the disease were constitutionally pre-disposed to pulmonary complaints; indeed two individuals out of these families died of consumption, (both colliers, but not stone-workers,) but without black sputa.

"2d†. To this very interesting query, I am sorry I can return no answer. There are no lime-works in this neighbourhood in which the operations are carried on by mining.

"3d‡. All those who have suffered under my observation, have been somewhat advanced in life; none younger than forty, generally fifty, and upwards.

"4th§. I have never seen a case in which the progress of the disease was rapid. On the contrary, many years elapsed from the first feeling of infirmity in the breathing to the final termination. One circumstance I have observed to be of universal occurrence, viz., that the cough was not influenced by the weather in the same degree as in ordinary phthisis.

* "Whether the black spittle occurs in one class of workmen employed in coal-pits more than another?"

† "Whether other miners than those employed in coal-pits are liable to the disease?"

‡ "Whether it occurs at one time of life more than another?"

§ "What is the general course of the disease?"

I have often obtained for such invalids a situation in the work above ground, where perhaps they had covering but not shelter, and the progress of the disease was uniformly for a time arrested, yet in no instance was a cure effected.

"5th. I have had no opportunity of examining a body after death. To dissect a collier is *periculosæ plenum opus aleæ.*

"I have only one other observation to make. At the colliery I attended, not a single case of this peculiar disease occurred among those employed in the pits where gunpowder was not used, and yet all worked by lamp-light. If the lamp-black from the oil-lamps be the cause, this fact is not easily explained."

I have much pleasure in laying before the Society the following very interesting communication from Mr. Philp, surgeon, of Aberdour, in which he has very ably pointed out the influence exerted upon the health of coal-miners, by the nature of their occupation, and the accessory circumstances under which it may be pursued.

"Aberdour, Fife, 6th October, 1834.

"MY DEAR SIR,

"I had the pleasure to receive a letter from your son a few weeks ago, regarding some notice of the disease peculiar to miners, which I promised to send to you: I had not forgotten the subject, but have delayed writing to you until now that I might make farther inquiry, and also that I might be able to

communicate to you the particulars of another *post mortem* examination, which I expected to obtain. It was only two or three days ago that the opportunity of making this occurred*.

"In detailing the history and symptoms of this disease, which is strictly spurious melanosis of the lungs, I think it right in the first place to mention the symptoms produced by exposure to the foul air or choke-damp of the pits. When an individual has been thus exposed, he complains of severe pain and violent throbbing in his head, languor, loss of appetite, feeling of distention in the epigastric region, furred tongue, costive bowels; and where the exposure has been for a considerable time there is, in addition, a smart attack of fever. This is the first stage, which generally passes off in a few days. If the individual continues to work in foul air, he does not suffer so acutely; there is seldom any fever, neither is the head-ache of the same severe character as in the first stage. The symptoms are now more those of dyspepsia,—great loss of appetite, flatulent and acid eructations, torpid bowels, and a feeling of debility. Severe pleurodynia is also a very constant symptom at this time, and is very difficult to remove. There is also occasionally severe muscular pain of the head and neck.

"In a short time after the occurrence of these symptoms, the patient suffers from habitual dyspnœa and wheezing, and subsequently a hard, dry, rending

* "My opportunities of observing this disease, I may mention, have been at Fordel Colliery."

cough, occurring chiefly in the mornings, accompanied with retchings. This stage is of various duration, according to the constancy with which the individual continues to work at the mining employment, but generally it is of more than two or three years' duration.

"The individual continuing to work in the foul air, the above symptoms all become aggravated, particularly the dyspnœa and the cough, which is now accompanied with an expectoration, at first of viscid mucus of the usual colour, but soon becoming of a greyish or bluish colour, and acquiring a darker tinge as the disease advances, until it is of a deep black colour, like printers' ink, or the pigmentum nigrum. This black matter is expectorated in the greatest purity in the mornings; during the day it is generally mixed with mucus. The dyspnœa is now of a peculiar character, different from what I have observed in other diseases of the lungs. The patient does not complain of pain or oppression about the chest; when sitting still, he can often take a tolerably full inspiration; but on walking across the room two or three times, or on walking up the least ascent, the breathing becomes painfully laborious or spasmodic, respiration being then performed by the aid of the subsidiary muscles of respiration. When the patient is asked how he feels, he answers that he is quite well, if allowed to remain quiet. The countenance becomes very sallow, emaciation takes place, the strength gradually declines, the most prominent symptoms towards the close of the disease being the

cough with difficult expectoration of the melanotic matter and mucus, and the above described affection of the breathing. There is no hectic fever, no colliquative diarrhœa or perspirations, the patient dying rather with the symptoms of exhaustion than of severe disease, and consciousness remaining almost to dissolution.

"The above detail of symptoms applies to the genuine form of this disease, for it is sometimes combined with chronic bronchitis and tubercular phthisis, which modify the symptoms and alter the course of the affection. The quantity of melanotic matter expectorated is often to the extent of ten or twelve ounces daily. The duration of the disease in the last stage, or that of debility, is very various, generally from six to twelve months. The pulse during the middle period is not increased in frequency; but when the hard, rending cough begins, the pulse is hard and inflammatory: during the last period, it seldom exceeds 90 or 100 per minute. Hæmoptysis has occurred in only one case, and that in a slight degree. In two persons of scrofulous habit, father and son, the peculiar symptoms of the disease were lost in those of tubercular consumption, and death took place in these two cases in a much shorter time than in any of the others.

"During the last eleven years I have lost eighteen patients in this disease. Of these, two were under twenty years of age; three or four from twenty to thirty; the greatest number from thirty to forty-five, and one forty-nine years. In two or three cases,

in persons who had shewn decided symptoms of the middle period of this disorder, and who had been persuaded to refrain from working at the mining department, the disease has for several years made no progress; the patients enjoy comparatively good health, although they still suffer from indigestion and dyspnœa. I have had an opportunity of making a *post mortem* examination in three instances only. There are probably two stages in the disorganization of the lungs, first a solidification, and in the further progress of the disease, a softening and liquefaction of the melanotic lung.

" The principal points of diagnosis betwixt this disease and tubercular consumption are, the affection of the stomach forming the chief symptom during the early part of the disease; its slower progress; the peculiar affection of the respiration; latterly the pathognomonic symptom of the 'black spit;' the absence of purulent expectoration in the genuine cases of the disease, and likewise the absence of hectic fever, colliquative perspirations, and diarrhœa. The emaciation is also to a less extent; the countenance is of a sallow hue, and consequently very different from that of a hectic patient, and the termination is also different in the two diseases.

" It appears to me that this disease is caused by inhaling, for a length of time, the impure air of the mines, this impurity being caused by a mixture of carbonic acid gas with the atmospheric air. I have come to this conclusion from a consideration of the following circumstances. All the individuals whom

I have seen suffering from this disease were males. In tracing their history I have always found that they have worked less or more at what is technically called 'stone-work.' The stone-workers form but a small proportion of the workmen employed in a coal-pit, not more than twenty out of 130 or 140. Among the greater number who work constantly at the coal-wall, that is in heaving the coal, I have not found any instances of the disease to occur. In working at stone-work, that is in sinking pits and driving mines of communication, the workmen are exposed in an eminent degree to the influence of the impure air; for besides working in a confined space, and in a cul-de-sac, where the ventilation is very imperfect, there is also a considerable exudation of the carbonic acid gas from the fresh-cut surfaces of the minerals. In this impure air they continue to work for many hours daily for some months, their operations being frequently carried on several yards in advance of where their lamps will burn. In working at the 'coal-wall,' on the other hand, the workmen are in large roomy spaces, where every attention is paid to maintain a free ventilation. Amongst this class of workmen I have only met with two cases of the disease, some having worked for forty or fifty years as colliers without suffering at all. The first exception occurred in a man named Robert Beveridge. Two or three months ago, a fortnight after having received a contusion on the chest, this man was attacked with severe cough, and expectorated daily, for some days, a considerable quantity of pure melanotic matter,

exactly like black paint, without any mixture of mucus. With the exception of habitual dyspnœa, this man is now in good health, and at work. He never worked at stone-mining, but for a long time he worked in a colliery where the air was very impure. The second case is that of James Japp. When exploring a mine, he was knocked down and his light extinguished by a gust of foul air, after which he lay for some time in a helpless state. Since then he has suffered from the dyspeptic symptoms, and from the cough peculiar to this complaint. This man never worked at stone-work, and previously to the above mentioned occurrence, was free from all symptoms of the disease. Further, although a number of labourers (not colliers) and of women are employed underground in various parts of the pits, no case has ever occurred amongst them. During the close sultry weather of summer, ventilation cannot be properly accomplished; the air becomes impure in all the workings, and in consequence of this all classes of the work-people, colliers, labourers and women, become affected with symptoms of the first stage. I may also mention that horses long employed under ground in those pits in which the air is foul, become affected in their breathing and with cough, making it necessary to bring them to the surface for change of air. Those pits and mines which have been noted for the impurity of the air have given origin to the greatest number of cases, for instance, Cuttlehill pit and the Holborn mine. In the working of this last,

out of a gang of ten or twelve, four have died. In the Renown pit the air is frequently impure, and the workmen often suffer from headache, dyspnœa, and dyspepsia. On the contrary, the new Venerable pit, remarkable for the purity of its air, has not furnished any cases.

" In conclusion, on this point I have to remark, that a considerable diminution has occurred of late years in the number of instances of this disease, attributable, I think, to the necessary mining operations being now completed, and no new mines in operation. The cases at present under treatment are chiefly of old standing, and their origin can be traced to the older workings.

" It has been supposed by some, that this disease is caused by the inhalation of carbonaceous matter, such as coal-dust, and the soot and smoke of the oil-lamps used in working. In refutation of this opinion, I beg to refer to what I have before stated, regarding the exemption of colliers from this disease, who are freely exposed to both of these alleged causes; and I have further to mention, that no case has ever occurred amongst the waggon-fillers and the coal-stowers, who are much more exposed to the influence of coal-dust than the colliers.

" It has also been supposed, that this disease is caused by inhaling the smoke from the gunpowder used in blasting. In opposition to this, I think it only necessary to mention that cases have occurred where there has been no exposure to the smoke of

gunpowder; and, further, that I am not aware of this disease prevailing amongst those who are much more exposed to this cause than miners are:

"Since writing the above, I have seen and examined an intelligent miner in the Carron Company's lime-quarries at Newbigging, a short distance from Dunfermline, who has worked in various mines. His evidence is corroborative of what I have stated as to the cause of this disease. He says, it prevails most amongst workings in free-stone and in whinstone, or a mixture of both of these minerals, but is unknown amongst the workings in lime-stone.

"These are all the particulars with which I consider it necessary to trouble you concerning this disease. I shall continue to investigate it, and any thing further worth communicating that may come to my knowledge, shall be forwarded to you. If there is any point on which you may wish further information, I shall be happy to furnish it. I remain,

"My dear sir, yours sincerely,

"J. PHILP."

With regard to the occurrence of this affection among the miners of Mid Lothian, we have received two very important communications from Mr. Steele, of Craighall, and from Stevenson, of Gilmerton, to both of whom I am indebted for an opportunity of seeing cases of the disease that had occurred in their practice.

"Craighall, Musselburgh,
9th September, 1834.

"DEAR SIR,

"That peculiar form of pulmonic affection to which coal-miners are so subject, and to which you allude in your late communication, has very often attracted my notice. It is a malady of frequent occurrence among the workmen at the Sherriffhall, Craighall, and Edmonstone collieries, and I have at all times under my care individuals in every stage of the disease.

"The black matter expectorated by colliers is of two kinds. One is simply the coal-dust inhaled while the individual is at work, and this is spit by every collier, the quantity varying according to the nature of the coal and the manner in which it is worked. Thus, if the air be confined, and if the coal be dry, and if it be worked in a manner which is technically called *shearing*, the quantity of dust inhaled is considerable; whereas, if the coal be wet, and if, as sometimes happens, there be a current of air blowing in a direction *from* the miner, and more particularly if the workings are conducted according to the *long-wall* method, the quantity is comparatively trifling. The dust thus inhaled is never considered by the workmen as at all dangerous, and is generally wholly expectorated in a few hours, or at most in a day or two after exposure. The miners are of opinion that eating largely of fresh butter facilitates its expectoration.

"The other kind of black matter is of a very different nature, being generated in the lungs themselves. It does not, however, seem to be connected, either as cause or effect, with any seriously morbid condition of the pulmonary structure, as it may be perceived more or less impregnating the sputa of many miners who do not suffer from any pulmonary complaint. When its formation has once taken place, it appears never afterwards entirely to leave the lungs, but maintains its existence within the body during the remainder of life, and this, although the individual afflicted with it does not continue to work as a miner. When the disposition to produce it has been created, that disposition continues after the cause has been removed. D. Wilson, a miner, was not under ground for twenty-four weeks, and during the whole of that time had black spit. He is a stout healthy man about fifty, of florid complexion, and never had a pectoral complaint. This man's wife has not been in a pit for fourteen years, and has a constant black spit without any pectoral complaint. T. Ross, after having been a number of years employed as a miner, was at sea for three years; and during the whole of that time his sputa were never perfectly free from a black impregnation. I could cite numberless cases similar to these.

"There are no men at any of the coal-works which I attend who are employed in removing, with the aid of gunpowder, the free-stone which separates the different layers of coal, but a number of workmen are employed in removing a stratum of stone lying

above the coal. This is done for the purpose of heightening the roads after the coal itself has been removed by the collier, and is effected with picks and wedges. The work is all above head; a great quantity of stone-dust is inhaled by the men, but they do not complain of it as injurious. The men who do this work are, however, employed at it only two or three days in a week, and sometimes not so much.

"I consider the pulmonary disease of coal-miners to be excited chiefly by two causes, viz., running mines in stone, and working in impure air. In running stone-mines the workmen use gunpowder; there is often little and sometimes no ventilation; and the air is loaded with stony particles, with gunpowder-smoke, lamp-smoke, and sometimes, though not always, with choke-damp. This kind of work is a fertile source of evil, and if persisted in, sooner or later produces incurable disease in those who are engaged in it. The morbid affection thus induced is chronic bronchitis, and exhibits all the ordinary symptoms of that disease. It commences with a trifling cough, which is troublesome only in the mornings, and after the expectoration of a greater or smaller quantity of frothy mucus, it goes off, giving no further trouble until next morning, when the secretion of the preceding night excites a renewal of the cough for its expectoration. In this state matters continue, sometimes for several years; the man determines to give up stone-working, and does so for a time, but the inducement of a higher rate

of wages again tempts him to his destruction. The complaint advances; the cough becomes more severe; the secretion from the bronchia more copious and more difficult to be brought up: the individual complains also of tightness across the chest, shortness in the breathing, with a sense of fulness and occasional pulsation at the epigastrium: he feels himself getting unable for the same exertion as formerly, and when interrogated about the cause of his complaints, invariably ascribes them to stone-work and bad air. This man never recovers. He lays himself off work, and perhaps gets considerably better; he also gives up stone-working and returns to coal; but it is now too late; the evil is done; his bronchial membrane is in a state of chronic inflammation, and the coal-dust, which formerly was all but innocuous, now aggravates the morbid condition. Again he must drop working; he has frequent head-ache, and an aching weariness in the back and loins; his cough becomes more constant and more severe; sometimes it is very troublesome during the night, but in by far the greater number of cases, after passing a few hours during the early part of the night in unrefreshing sleep, he is awoke with sometimes an intense feeling of suffocation; his lips and face become livid, he throws his body forwards and grasps his knees with his hands, that being the only attitude in which respiration can be carried on. After a short time a fit of coughing commences, which ends in the slow expectoration of a great quantity of tenacious glairy

mucus, and leaves the patient in a state of complete exhaustion. The sputa are sometimes of a yellowish colour, often grey, and occasionally black; they have also at times a puriform admixture, and are not unfrequently tinged with blood. If the individual thus attacked be under forty years of age, and if he take care of himself, he may still be restored to the enjoyment, for a time at least, of tolerable health; but if towards fifty, there is no hope for him; he gradually becomes emaciated; his countenance becomes wan and anxious, his skin shrivelled, the veins on the surface prominent, the shoulders high, and the body bent forwards. He drags on a wearisome and unenviable existence, sometimes for a number of years, and occasionally attempting some trifling employment for a day or two at a time; but his dyspnœa and cough increasing, he gradually declines and dies from exhaustion.

"In other cases, although the bronchial affection is the first of which complaint is made, still, when medical aid is applied for, disease of the heart is the more prominent symptom. This seems to be induced by the impeded circulation in the lungs,—the consequence of the long continued inhalation of air impregnated with carbonic acid gas. The same circumstance also causes engorgement in the hepatic and mesenteric vessels, giving rise to abdominal pain, to hæmorrhoids, the discharge of black stools, or of dark blood in an unmixed state from the anus. In other cases, the determination is to the head, and relief is often ob-

tained by the discharge of black blood from the nose. I consider coal-miners to be peculiarly liable to disease of the heart and to aortic aneurism.

"2d. My experience does not enable me to say whether other miners are equally liable to this disease with coal-miners, as all those who are employed in stone-mines at the collieries here, work also, when not so employed, as colliers. But I should think that other miners must be equally liable to the bronchitic affection, and when this exists, the presence or absence of black spit seems of little consequence, as regards either the progress or termination of the disease. I form this opinion from the fact that those who restrict themselves to the working of coal are not peculiarly liable to pulmonary complaints, and they are as long-lived and as healthy as any class of labourers whatever. The temperature of the place in which they work is almost always warm and equable; they suffer little from any inflammatory complaint excepting rheumatism, and tubercular phthisis is among them a rare disease. I am informed of several robust-looking men, who wrought merely as sinkers of pits and not as miners, who fell victims to pulmonary disease, and some of whom had black spit. This, however, is not in my experience a common occurrence in the case of mere sinksmen. Some individuals are little injured by stone-mining compared with others. Abram Bennet, aged 68, is a stout erect man, who has wrought a great many years (about fifteen) at

stone-work. He has been a sinksman and has run many stone-mines, both in coal-fields and lime-quarries, and at other times worked as a collier. He complains neither of cough nor dyspnœa. There are others also, with whom I am acquainted, who have enjoyed a similar immunity from disease. Much depends upon the nature of the minerals through which the mine is carried; and in the Mid Lothian coal-field the edge seams are considered to be in a much greater degree injurious than the flat. This is owing chiefly to three circumstances:—1st. In the edge seams the strata are not so much impregnated with moisture. 2d. The cutting process by the pick of the miner is carried on more upon a line with his own face, and hence more dust is emitted and inhaled. But the principal reason is, that the stone contains some poisonous matter which is probably of a metallic nature, as the workmen complain of its exciting a styptic and metallic taste in the mouth. A mine was carried across the strata in the Niddry estate, the finishing of which required a number of years. Six or eight of the miners employed in it died; several were obliged to leave it, and only one of those who commenced it was able to work in it throughout and lived to see it completed. There was a particular stone in this mine, which was repeatedly met with, and to which the miners gave the name of arsenic, which was found highly pestiferous: its exact nature I am not acquainted with. In a stone-mine run some years ago in the Newbattle field, a great many men

died, the average length of tmie each of the miners employed in it lived, being about two years. The mortality was ascribed to the nature of the stone.

" 3d. The period of life at which the disease occurs must vary according to the length of time the individual has been exposed to the exciting cause, and to natural difference of constitution; and it must depend also on the nature of the minerals in which the mining operations are conducted. I have often seen it prove fatal about the age of from fifty to fifty-five.

" 4th. From the description above given may be gathered nearly all the information which I am able to give in regard to the course of the disease. It differs from ordinary tubercular consumption in being seldom attended with hectic fever, and never with the distinct and well marked hectic of the latter. In the disease under consideration the dyspnœa is in general much more distressing than in any cases of phthisis which I have witnessed. The emaciation is not so extreme. There are seldom colliquative sweats or diarrhœa. The fulness and frequency of the pulse met with in tubercular phthisis are not concomitants of this affection. In a great majority of cases phthisis makes its attack, and proves fatal much earlier in life than this disease is ever met with; and in the latter there is a livid discolouration of the lips and hands, and sometimes of the face, and not unfrequently anasarca in a greater or less degree.

" I regret that I have not kept notes of the *post mortem* appearances in any of the bodies which I examined, with the exception of only one or two;

and in these my attention was more particularly directed to the morbid condition of the heart than of the lungs. Indeed the state of the bronchia has been so uniformly the same, or nearly so, that of late I have not in every case minutely examined it. The mucous membrane is highly vascular, generally soft and swollen, and not unfrequently ulcerated. The lungs in several cases contained black, carbonaceous-looking matter, lying along the course of the bronchial tubes, and enclosed in bags of cellular membrane. I have seen it sometimes distributed through the lungs in little nodules; and in one case which I distinctly recollect, this black matter pervaded their whole substance, and the hand of the dissector on being withdrawn from the chest, after the substance of the lungs had been cut into, had the same appearance as if it had been dipped in a basin of thick charcoal and water.

"It may not, perhaps, be unworthy of being mentioned, that while stone-mining seems injurious, chiefly if not solely, to the pulmonary structure, the deleterious effect produced by the inhalation of choke-damp is exerted principally upon the heart. I have often thought that the production of the black pulmonary matter resulted rather from some condition of the system produced by the circulation through it of imperfectly oxygenated blood, than from any direct effect produced merely on the lungs by the inhaled stone-dust or impure air. There is nothing further in connexion with this subject which occurs to me at present as worth communicating.

It would afford me much gratification if any means could be devised as regards either prevention or remedy, whereby might be lessened the evils of a disease, the ravages of which, upon the most robust constitutions, I have every day cause to deplore.

"Yours, faithfully,

"GEO. STEELE."

"Gilmerton, 7th November, 1834.

"DEAR SIR,

"In your letter of the 30th of August, you ask, 1st, Whether the black spittle occurs in persons working in particular coal-pits more than in others, or in one class of workmen employed in coal-pits more than another?—In answer to this question, I have to state that in this place I have never yet been able to trace it to colliers at all, unless they may have combined mining operations with their usual work at the coal-wall. Indeed, from the cases that have fallen under my own observation, I have come to the conclusion that no collier or individual engaged in working coal only, either by blasting it with gunpowder or hewing it out in the ordinary way, does ever present the least expectoration of this sort while labouring under pulmonary consumption; but that it is confined entirely to those employed in stone-mining, or carrying through a communication below ground from one seam of coal to another, in certain kinds of hard rock, especially when, from the position of the strata or otherwise, much use is made of the pick; and I am further led to believe that

some species of rock are worse in this respect than others*. Some of the workmen suppose, that the use of gunpowder contributes greatly to the formation of the disease, but from what I have been able to learn, without any proper foundation. For although the spittle may be black after inhaling for a length of time the smoke arising from the different explosions in close mines, yet the blackness generally disappears within a few days, or a week at most, in the same manner as when it is induced by lamp-smoke, leaving the lungs perfectly sound.

"2d. Whether miners or other classes of workmen, besides those employed in coal-mines, are liable to the disease?—In this neighbourhood both lime and sandstone are extensively quarried, yet the men engaged in that kind of work never show the least disposition towards this affection, when labouring under phthisis; they spit up nothing but mucus, purulent matter, or blood.

"3d. Whether it occurs at one time of life more than another? The time of life may occasionally have a slight influence in hastening or retarding the coming on of the disease; for if a workman begins sinking coal-pits or driving mines, while young, the

* Mr. Stevenson has had the kindness to procure me specimens of most of the rocks in which these mining operations are conducted, and to arrange them according to the degree of prejudicial influence which they are supposed to exert on the miners. But it will require an extended series of observations to enable us to judge how far any connexion can be traced between the prevalence of this affection in miners and the particular kinds of rocks in which they have occasion to work.

constitution may, and I have no doubt from my own observation, does resist the baneful effects of such an exposure of the lungs to the noxious influence of the dust which arises from the hard rock in close mines, and especially in those in which there is a scarcity of water. If a miner continues for two, or at furthest three years, constantly, or even at intervals, engaged in this kind of work, he is sure to suffer, let him have been ever so robust before he commenced it. You will observe, that I allude to this locality in saying that so much danger is to be apprehended, because I am quite aware that in other places, nay, even a few miles distant, such a complaint is scarcely ever heard of. It would therefore appear that the evil arises from the particular species of rock through which the mines are driven, and not from the mere operation of mining alone.

"4th. What is the general course of the disease; in what respects does it correspond with or differ from the ordinary tubercular consumption; and whether the black discolouration of the sputa is constant or only occasional?—Phthisis, when this discolouration of the sputa presents itself, alters in no respect its regular course. This symptom, however, may occur even so much as eight or ten years before pus is discharged, and at various intervals during that time. Sometimes the colour is regular, of a deep black hue, without either mucus or pus being observed in it, while at other times, in the same person, it may assume a lighter or bluish shade, from the quantity of phlegm or other matter spit up along with it;

and in the morning it is, for the most part, darker and more copious than throughout the day. Its commencement is at times quite unexpected, and the individual is surprised at the colour of his spittle; but oftener it is preceded by more or less difficulty of breathing, general weakness, and an inability to continue work regularly. It will continue for days or weeks together, but frequently it intermits or partially stops, evidently shewing that the black matter is in the form of tubercles, or contained in cells, by the bursting of which their contents are discharged into the bronchia and thus spit up. The quantity brought up varies from a very small quantity to nearly half a pint at a time, according, it is to be presumed, to the size of the space in which it was contained. When this black matter is pressed between the finger and thumb, it does not feel gritty, nor does it contain any particles of small stone: it is of the most delicate fineness and uniformity of texture, similar to lamp-black. At the commencement of the disease it floats in water, from the admixture, probably of mucus; but it sinks towards the end as the pus becomes more abundant.

"The cause of this kind of spittle is evidently working too long in certain coal or rather stone-mines; and some mines are much worse than others in producing this effect. The stone or rock in this district which is reckoned the worst, is what the miners call sand-stone, because more sand or dust flies from it, when struck with the hammer or hewn with the pick, than from the other kinds of rock. It is not

sand-stone in the ordinary sense of the word, but a very hard bastard lime and whin rock, of a dark-blue colour, and sometimes mixed with spar.

"Colliers spit up the black-coom or dust of the coal, and miners the stone dust, in other districts, without any attack of phthisis whatever. How that disease should happen here, and how the black substance is formed in the lungs, I cannot explain.

"I confess that not having turned my attention to the *post mortem* appearances in this disease very particularly, nor perhaps with that minuteness which it deserved, I feel unable to give you any thing at all satisfactory on the subject. I may mention, however, from the recollection of two or three examinations, that the parenchyma of the lungs appeared interspersed with tubercles, filled with this sooty-looking matter, and varying in size from that of a small pea to that of a walnut; and that by the time death occurred, a considerable portion of that organ had disappeared, leaving cavities with an irregular ragged surface, partly covered with purulent matter, and having deep indentations where the coloured contents had been discharged. In all other respects the morbid appearances bore the strongest resemblance to those of tubercular consumption."

Dr. Hamilton, in the communication already referred to, has noticed two cases of which he had been informed by Mr. Girdwood, surgeon of Falkirk, in which persons, who had been employed as moulders in the Carron Company's work, had died after discharging considerable quantities of dark-coloured or

black expectoration, but in whom an examination after death was not obtained. I am indebted to Mr. Girdwood for some additional particulars respecting these cases, as well as for some interesting information respecting the health of moulders, which I hope to have another opportunity of laying before the Society.

"Braid, aged 56, from Stenhouse Muir, had been a moulder for forty years. He had eleven children. Three daughters, aged 19, 21, and 27 years, died of phthisis previous to his decease. He has four sons, aged 30, 21, 19, and 14, all employed as moulders, and all of whom have enjoyed good health, and are at present well.

"I first saw him in May, 1833, and was only asked, as a matter of curiosity, to visit him, as his family were astonished at the appearance of his expectoration. He had become ill about the beginning of January, and had been only once in the works from the commencement of his illness. Both he and his wife firmly maintained, that from January to the end of April his expectoration was yellowish,—in every respect similar to what his daughters had discharged; and that the change to dark took place in one day, after which it continued of this character till the time of his death, which happened in the following January. His expectoration amounted to about half a mutchkin (two ounces) or more daily. His widow states, that previous to his illness she had not observed any thing peculiar in his sputum, nor had he ever mentioned such an occurrence to her.

" Craig, aged 55, stout and of a ruddy face, came under my care the 1st of January, 1834, for severe hæmoptysis. In about a month he was able to go about, and continued so for six weeks, but did not return to his work. During his recovery he had copious expectoration, which, according to my own observation, was of a yellowish colour. About six months previous to his decease it became very dark, though not to such a degree as in the former case. Through the whole course of the disease he had severe pain in the right side of the chest."

I have now laid before the Society the principal part of the information which we have hitherto obtained, respecting the occurrence of black expectoration and of black infiltration of the lungs in coal-miners and iron-moulders. I may be allowed to express an opinion, that the extent and accuracy of that information are highly creditable to the zeal and intelligence of those by whom it has been furnished. It must be obvious, however, that the co-operation of a number of persons, residing in different districts, is still requisite to furnish the materials necessary for a correct comprehension of the nature and origin of these affections. The queries which have been addressed by my father and myself to those who we thought were likely to take an interest in the investigation, and to have it in their power to advance it, have varied from time to time with the progressive extension of our own knowledge of the subject respecting which we were desirous to elicit information. I shall here subjoin those queries in the form in which

they were last issued, in the hope that they may be useful to those whose opportunities may enable them to prosecute the inquiry.

80, George Street, Edinburgh.

SIR,

Our attention happening to have been particularly called to the occurrence of black expectoration, and of infiltration of the lungs with black matter, in coal-miners and moulders in iron-works, we are very desirous to learn whether these appearances have been observed amongst the same classes of workmen in other districts of the country; and whether they have been met with in other classes of workmen, who, from their occupation, are exposed to the inhalation of an atmosphere loaded with carbonaceous or other matters, either in a gaseous or pulverulent form. With this view we venture to request that you will have the goodness to inform us, whether any thing of the kind has fallen under your observation among the workmen employed in the mines or manufactories in the district or districts in which you have practised.

The black expectoration to which we allude, is not the mere slight tinging of the sputa to which every person is more or less subject, who lives in a smoky atmosphere, and in which the lungs seem to eject in the morning, all the carbonaceous particles inhaled during the previous day; but a very considerable discolouration, which goes on for a length of time in persons who have voluntarily, or in con-

sequence of bad health, abandoned the kind of occupation which exposed them to the inhalation of carbonaceous matters.

If such an appearance has presented itself to your notice, we are desirous to be informed:—

1st. Whether you have found it to occur in particular mines or manufactories more than in others, or in one class of the workmen employed in those establishments more than another?

2d. Whether it appears to you to depend on an imperfect evolution of carbon from the lungs, in consequence of the persons respiring a confined or vitiated atmosphere, or to be occasioned by the inhalation of extraneous carbonaceous matters; and if by the latter, what you conceive these matters to be, —the smoke of the lamps or candles employed by the workmen; or of the gunpowder employed in some mines in blasting; or what other agent? Should you have formed any opinion on this point, may we request you to state the grounds of it?

3d. Whether the black expectoration occurs more frequently in persons apparently healthy, particularly as regards the pulmonary organs, or in persons in whom there is reason to suspect a morbid condition of those organs, such as chronic bronchitis or tubercular consumption?

4th. Whether the black colour of the sputa is constant or only occasional?

5th. Whether in any cases of this kind you have had an opportunity of ascertaining, after death, the state of the lungs and bronchial glands? And,

Lastly, whether in any dissections you have made, of persons whose sputa had not been so discoloured, you have found the lungs infiltrated with black matter capable of tinging the hands, and of communicating to water the colour of china-ink?

Hoping that you will pardon the freedom of this application, and be disposed to assist us in the prosecution of our inquiries,

We have the honour, &c.

SEQUEL

OF

THE HISTORY OF A CASE

IN WHICH THE

EXTERNAL ILIAC ARTERY

WAS TIED;

WITH AN ACCOUNT OF

THE CONDITION OF THE BLOOD-VESSELS

IN THE LIMB

AFTER DEATH.

COMMUNICATED BY G. NORMAN, ESQ.,

ETC., ETC., BATH.

READ NOVEMBER 8TH, 1836.

THE Medico-Chirurgical Society having done me the honour of publishing, in the 10th Volume of their Transactions, some Cases of Aneurism with observations, I beg to offer to its notice some further particulars connected with one of the cases there related, which present some points of interest from the opportunity that offered itself of examining the state of collateral circulation at the end of so long a period as twenty years.

Joseph Hicks, the subject of the case related at page 95, Vol. X., continued free from any aneurismal

disease from the time of the operation. During the last two years of his life he had several slight threatenings of apoplexy, and was habitually subject to swelling of the feet and legs. He died February 2d, 1834, of an attack of Asiatic cholera.

On examination after death, independent of the appearances in the alimentary canal characteristic of cholera, there was found some thickening and dilatation of the left venticle of the heart, with deposition of bony matter in the mitral valve. The arch of the aorta was somewhat dilated and presented several patches of ossific deposit.

The arteries of the right lower extremity were filled with wax injection from the lower part of the aorta; the injection passing so freely as fully to distend the extreme branches in the foot and elsewhere. The following are the principal results of the subsequent dissection.

The external iliac vein was pervious, and presented nothing calling for remark.

The external iliac artery was obliterated from the bifurcation of the common iliac to a point corresponding nearly to the lower edge of Poupart's ligament, and about one-eighth of an inch above the origins of the epigastric and circumflexa ilii arteries; it there again became pervious and of equal size with the vessel in the opposite limb. The cord occupying the place of the obliterated vessel was of considerable size; the arterial coats perfectly distinct; and a probe introduced into its centre readily separated the adherent surfaces of the internal coat until it reached

a point about an inch above Poupart's ligament, where all traces of the natural textures were lost and replaced by a dense fibrous bundle.

About four inches below the crural arch, at the outer and posterior part of the femoral artery, was found a mass as large as a small walnut, composed of dense fibro-cellular substance: it involved the first part of the common origin of the profunda and external circumflex arteries, which, though obliterated, could be distinctly traced to the femoral. A portion of the profunda of about two inches was thus circumstanced; no injection having passed into it, and the remaining part of the vessel, which was of small size, being filled by the communication of its branches with other sources of supply.

The collateral circulation had obviously been mainly carried on by the ramifications of the internal iliac artery, which was nearly as large as the femoral. The manner in which it was effected may be described as follows.

1. The ilio-lumbar artery, of very large size, gave several branches to the lumbar plexus of nerves, descending in the substance of the anterior crural nerve as several elongated tortuous vessels communicating at the upper and outer part of the thigh with branches ordinarily derived from the external circumflex, and reaching to the fibro-cellular mass already noticed. Other ramifications of the ilio-lumbar anastomosed with those of the circumflexa ilii, and also by that medium, on the one hand,

with the inferior lumbar arteries, on the other, with the external circumflex of the thigh.

2. The obturator artery was proportionally much the largest division of the internal iliac and with its branches very tortuous. Immediately before its passage through the obturator foramen, it gave off a large branch communicating with the epigastric at a very short distance from its origin, and forming apparently the chief source of supply to the epigastric, which was itself comparatively small. Directly after its emergence at the upper and inner part of the thigh, many of its external ramifications, much enlarged and very tortuous, inosculated freely with corresponding branches of the internal circumflex, also of large size.

3. The gluteal artery was of average size: some of its anterior branches emerging on the dorsum of the ilium from among the gluteal muscles united with ascending branches derived from the external circumflex of the thigh.

4. The ischiatic artery was enlarged, and communicated tolerably freely with the posterior divisions of the profunda.

5. The internal pudendal artery was also of unusual size, and numerous tortuous twigs, collectively of considerable capacity, derived from its external branches, established a communication between the internal iliac and various branches, chiefly of the internal circumflex at the upper and inner part of the thigh.

RESEARCHES

ON

SOME POINTS

OF THE PATHOLOGY

OF

PULMONARY TUBERCLES.

By PETER NUGENT KINGSTON, M.D.,
PHYSICIAN TO THE ST. GEORGE'S AND ST. JAMES'S DISPENSARY.

READ MARCH 28TH, 1836.

So large a portion of the human race fall victims to pulmonary tubercle, that too much time and attention can hardly be employed in perfecting its diagnosis, prognosis, treatment, and prophylaxis. Little further progress can be made towards this end until the pathology of the disease has been accurately developed *. My present design is to shew, 1st, that the common pulmonary tubercle is a vascular texture; 2dly, that it sometimes originates in an alteration of the air-cells and their secretions; and 3dly, that now and then it

* "The utmost exertions of the British practitioner," said Dr. Abercrombie, in 1821, "will be amply rewarded, if any degree of precision can be introduced into the pathology of consumption. At present it is certainly vague and unsatisfactory in the greatest degree."—Edinburgh Med. and Surg. Journal.

is entirely healed, when it has even extended over a very large portion of the lungs.

I.

The opinion that pulmonary tubercles are destitute of nutrient vessels, and consequently of all the properties of organization, originated about half a century ago with Stark. It has since been held by the majority of pathologists, and prevails in the present day. I shall nevertheless endeavour to shew that the facts on which it rests do not warrant such an inference; and shall adduce a number of cases in which the vascularity of the common pulmonary tubercle admitted of ocular demonstration.

The principal ground on which the vascularity of pulmonary tubercles has been denied is, that they cannot be injected from the vessels of the lungs. Thus, Dr. Alison, one of our most judicious pathologists, observes, "It does not appear from injections that tubercles are themselves provided with vessels, and hence they have been called morbid secretions, perhaps more properly than adventitious textures." *

This argument assumes that no vessels can be so small, even in the most delicately organized parts, as not to admit, and be brought into view by the fluids employed for anatomical injection. But the point assumed is far from being established. It is contrary to the opinions of some of the highest authorities in physiology and practical anatomy. Thus the late Dr. Gordon, of Edinburgh, in his esteemed work on

* Outlines of Pathology, 1832.

General Anatomy, observes, "At last, however, after gradually diminishing as they divide, all the capillary arteries are seen to terminate in one or other of two ways; they either pass distinctly into the capillary branches of veins, or end abruptly unconnected with any other vessel. Whether in this latter case, however, the arteries do really terminate where they seem to do, is very doubtful. Perhaps they are continued much farther, and yet are imperceptible from their minuteness, even by the most powerful microscopes."

In the healthy condition of the articular cartilages no vessels can be discerned, even after the finest injections. Yet in some cases of inflammation red vessels have been distinctly seen traversing their substance *. That these should have owed their existance to the inflammation, is inconceivable. Whereas nothing is more conformable to analogy than to suppose, that the cartilages are, in their healthy state, supplied with nutrient vessels too minute to carry red blood or to admit the coarse injections of anatomists; and that, when the cartilages inflame, their vessels, like those of other inflamed parts, dilate so as to acquire a distinctness not naturally possessed. This is the inference drawn by many of the most eminent pathologists and anatomists. "In the adult person," says Sir Benjamin Brodie, referring to the articular cartilages, "these canals for the distribution of blood are not perceptible. This proves that they are very minute, but not that they are altogether wanting."

* See Sir Benjamin Brodie on the Diseases of the Joints, and Bichat's Anat. Gen.

Speaking of cartilage in the adult, the late Dr. Gordon remarks, "There is no doubt of its being vascular; but I do not know of any method by which its blood-vessels can be injected after death. These vessels therefore must be very minute." *

The recent successes of Mr. Kiernan afford ground for hope, that by improved modes of injection structures hitherto intractable may hereafter be made to display their organization. At present, the impermeability to injections cannot be admitted as proving the absence of vascularity in parts whose vessels must be presumed to be so diminutive as those which nourish pulmonary tubercles.

But I shall now show that, in the case of pulmonary tubercles, injection has never been fairly tried.

It was discovered by Rusch, that the nutrition of the lungs is performed mainly by the bronchial arteries. Reisseissen has lately observed, that those branches of the bronchial arteries, which ramify through the air-cells, receive anastomoses from the pulmonary arteries, and terminate in the pulmonary veins. So porous are these minute vessels and the air-cells which they traverse, that their contents are freely exposed to the influence of the air; and thus the blood of the bronchial arteries, though mixed with the venous blood of the pulmonary arteries, has its purity restored in time to perform the work of nutrition; and when it passes into the radicles of the pulmonary veins, it again becomes oxygenated, before it is conveyed to the left side of the heart.

* See also Bichat's Anat. Gen.

But the same author has shown that in those parts of the pulmonary structure which are impervious to air, there is not this admixture of venous with the arterial blood, and that the blood by which they are nourished, is derived exclusively from the bronchial arteries, and returned exclusively by the bronchial veins. Now this is the case of pulmonary tubercles: their texture is too compact to give access to the air: their nutrient vessels, if any exist, may therefore be presumed to be solely connected with the bronchial arteries and veins: whence it is obvious, that to attempt their injection with any reasonable hope of success, the fluid should be thrown into the bronchial arteries. Instead of this the pulmonary arteries and veins have alone been resorted to, while the bronchial arteries have been neglected.

Having shown the invalidity of the evidence adduced to prove the non-vascularity of pulmonary tubercles, I proceed to give an account of seven cases in which great numbers of pulmonary tubercles of the ordinary kind were distinctly seen to be traversed by red vessels.

They had not in their symptoms differed from the generality of cases in which tubercles have been found in the lungs after death. Cough, dyspnœa, pain of chest, night-sweating, diarrhœa, emaciation, had most of them been present in all. The subjects were of all ages, 7, 15, 21, 26, 42, 61, 65. In each, the lungs presented every stage of tuberculous disease. In some places there were transparent or semi-transparent, colourless or whitish bodies, many of them

rounded or oblong, varying in size from that of a grain of sand to that of a hemp-seed, from cartilaginous to fleshy firmness. In other places, the bodies were nearly or altogether opaque, and of a whiter or yellowish hue; some were firm, others softened or quite liquid. Excavations had been formed, principally at the apices of the superior lobes. In two of the cases the tuberculation had for the most part assumed the form which has been termed infiltration.

In every one of these cases a great number of the isolated solid tubercles, both such as were white or yellowish and opaque, and such as were greyish and translucent, presented the following appearances. A careful section being made of the tubercle intended for examination, the cut surface was seen by a strong magnifying glass, sometimes also with the naked eye, to be traversed by continuous red lines, which were sometimes short and unconnected, but often of considerable length and making frequent ramifications and anastomoses, quite after the manner of small blood-vessels. An intelligent friend, to whom I showed the appearance, compared it to the arrangement of vessels in an inflamed conjunctiva. On several trials we found that these red lines could not be removed by being gently scraped with the edge of the scalpel. In many instances they might be traced from the centre to the circumference of the tubercles, whence they were sometimes seen to extend into the adjacent pulmonary parenchyma, or to communicate with the vessels in the neighbourhood. There is no room for

doubt that these red lines were blood-vessels: for such an appearance, when exhibited by solid parts, has always been considered decisively characteristic of vascularity.

In each case the number of tubercles in which red lines were visible was very great. When the portion of lung had grown stale by keeping, then, along with the red lines, there were some of a brownish red colour, and others which were dark-brown, or quite black. In all there were many tubercles in which no vascular appearance whatever was discernible. But it frequently happened that the pulmonary parenchyma, for a considerable distance around, was equally destitute of the appearance of red vessels. Indeed it may be observed of every tissue and organ in the body, that after death its vessels are sometimes filled with red blood, at other times empty, and that some parts are reddened, while others remain pale.

Whether those tubercles in which no vessels were to be seen after death were furnished with red blood during life, may therefore be questioned. But nutrient vessels of some kind must be conceded to them. For how can it be supposed that, agreeing in all other physical characters with those in which red vessels were visible, they differed so fundamentally as to be destitute of organization? The same may be said of several cases of pulmonary tubercles, in none of which I could find vessels containing red blood.

Two of the specimens of vascular tubercles, I shewed to my very intelligent friend Dr. Sutherland junior, who favoured me with the following tes-

timony to the correctness of the description above given.

CASE I.

"In a portion of the lung of Benjamin Farrer, which was thickly studded with miliary tubercles of the ordinary aspect, Dr. Kingston shewed me, to my perfect satisfaction, after a very attentive examination, that a great many of the tubercles had bright red lines, of the appearance of blood-vessels, not only at their circumference, but also traversing their interior (as was clearly seen, when these tubercles were carefully cut through the middle, in some instances with the naked eye, in others only by the aid of the microscope). These tubercles were more or less white, more or less translucent, of fleshy firmness, many of them rounded, from the size of a small shot to that of a small pea, for the most part discrete, but in some places clustered. In some of them a single bright red continuous streak was alone visible: in others there were several distinct bright red waving lines seen to ramify from a larger red trunk: in some these lines were very numerous, and put me in mind of the arrangement of vessels in an inflamed conjunctiva.

"A few of these tubercles, traversed with red vessels, I saw on the 16th, and a great many on the 17th. On the latter day (which was the 5th after death) some of the tubercules, besides one or two thicker red streaks, displayed a distinct appearance of beautifully arborescent lines, similar to those above described,

except that their colour, instead of being bright red, was in some instances a dingy red, in other instances a dark brown approaching to black.

"In some, the red vessels traversing the interior of the tubercles were seen to extend to, or to take their rise from the surface of the tubercles.

"A. J. SUTHERLAND."

"Sept. 23d, 1835."

CASE II.

"On November the 28th, 1835, Dr. Kingston shewed me a portion of recent lung which exhibited well characterized tubercles in all stages. Some were translucent and slightly white or greyish with black striæ. Others were less hard, were white or yellowish, and opaque or semi-opaque. Some were translucent and slightly white at the edges; yellow and opaque at some portion of their interior. Their size varied from that of a millet-seed to that of a small pea. Some were discrete, others clustered.

"Of two of the tubercles, which were whitish, semi-opaque, and of rather more than fleshy firmness, Dr. Kingston made a careful section, and then shewed me, by the aid of a powerful magnifying glass, very distinct red lines traversing the cut surface, in some instances seen to ramify, in one instance the ramification seeming to proceed from a thicker red point near the centre. In some places the red lines extended into the interior from the circumference. The appearance was most distinctly that of vessels; and, still more strongly than in the former case, reminded me of the arrangement of vessels in an inflamed con-

junctiva. Dr. Kingston made a second section of one of these tubercles, and upon the second surface I again saw red lines disposed after the same manner; but more minute.

"I was prevented by a previous appointment from waiting to examine more of the tubercles in regard to their vascularity: but feel perfectly satisfied, that in both the tubercles which I did examine there were continuous red arborescent lines traversing their interior, and extending in some instances to the circumference.

"A. J. SUTHERLAND."

"1, Parliament Street,
December 1, 1835."

The proof here adduced of the vascularity of the common pulmonary tubercle* appears to me complete in itself, and not liable to be shaken by any facts which may hereafter be brought to bear on the subject. I therefore have not deemed it necessary to ascertain the result of an injection by the bronchial arteries. Should it be found impracticable to inject the tubercles in this way, the failure could not in the least invalidate the present conclusion, as it would be referable to their extreme minuteness. Indeed, it has been observed by Reisseissen, the most successful injector of the vessels of the lungs, that even those

* I have as yet examined but few cases of the tubercles of other organs in respect to vascularity. But in one of the seven cases above analyzed, both the bronchial and the mesenteric glands contained yellowish, opaque, cheesy, somewhat rounded tubercles, about the size of hemp-seed, which were distinctly traversed by red vessels.

branches of the bronchial arteries which naturally ramify in the air-cells are incapable of admitting the finest injection. On the other hand, should the tubercles receive the injection, such evidence might not by all be considered decisive, as in the dead body thin injections are found to penetrate where no vascular communication is believed to exist.

If the fact which I have been endeavouring to establish be admitted, there is no longer any difficulty in explaining the changes of colour and consistence which take place in the interior of pulmonary tubercles during the several stages of their progress, and the frequent commencement of these changes in their centres. Whereas, under the supposition that tubercles are destitute of organization, these phenomena are inexplicable, or at least have received no explanation generally satisfactory to the profession.

II.

It was held by Tralles, nearly a century ago, that they sometimes consist of air-cells distended with morbid secretion, which has gradually solidified and acquired the various appearances presented by tubercles in their several forms and stages. During the last twenty years, observations in support of this opinion have been brought forward, first by Magendie and Cruveilhier, and since by Andral and Dr. Carswell.

Magendie was led to the conclusion by a dissection of lungs previously desiccated: but Cruveilhier thinks the process of desiccation liable to mislead the ob-

server by tearing and variously altering the appearance of the pulmonary vesicles.

Cruveilhier himself, in his first publication* on the subject in 1821, merely affirms that in the lungs of oxen some of the pulmonary lobules were so crowded with tubercles that one would say a tubercle corresponded to each air-vesicle: but he offers no proof that the air-vesicles had not been pushed aside, compressed, and atrophied by the development of tubercles in the intervesicular cellular tissue. In his second essay† in 1826, he relates a case in which, mercury having been injected into the trachea of a dog, the animal gradually wasted, and died in a month, and the lungs were found loaded with bodies exhibiting all the physical characters of miliary tubercles, and having each a globule of mercury in its centre. There can be little doubt that they were situated in the air-cells: and if they be admitted to have been true tubercles, they afford a strong analogy in favour of the supposition, that in at least some of the cases in which tubercles are produced by ordinary causes, they have this situation. But the identity of these with tubercles is denied by Gendrin: and Roche, Rochoux, Broussais, Laennec, Lobstein, and others, remained unconvinced.

Andral detected liquid or semi-liquid white opaque matter in extremely minute bronchi. But its tuberculous character may by some be doubted; and at

* Médecine éclairée par la Physiologie.

† Nouv. Bibl. Med.

all events, before we conclude that it was originally secreted into the vessels where it was found, we require evidence that it had not been derived from adjacent tubercles which had formed a communication with the bronchi by ulceration.

Dr. Carswell, whose skill in pathological investigations is generally allowed, has given delineations of portions of human lung, in which bronchi, some of them very minute, appear to be filled through several ramifications with solid tuberculous matter. He thus succeeded in that which Cruveilhier had tried in vain, and which Andral had considered impossible. Andral observes, " this seat of tuberculous matter cannot be established, except whilst the tuberculous matter is in its incipient state, that is to say, liquid or semi-liquid; then only the facility with which it may, by simple pressure, be expelled from the cavity containing it, permits one to recognize, that that cavity appertains to a bronchus, a fact which it is no longer possible to establish at a later period, from the difficulty of extracting the tuberculous matter entire and without laceration."* But Dr. Carswell's observations, however valuable, do not decisively prove that the tuberculous matter was originally deposited in the bronchi. For, though solid at the time of death, it may at one time have been liquid or mixed with liquid, and in that state have found its way into the bronchi, either from vomicæ or from softened tubercles in the neighbourhood, and may afterwards have had its fluid particles absorbed. Indeed, in several of Dr. Carswell's speci-

* Clin. Med.

mens of bronchi filled with tuberculous matter, these bronchi are represented as being in immediate communication with large excavations containing tuberculous matter of various consistence.

The evidence, therefore, in favour of the opinion that the bronchi and air-vesicles are sometimes the seat of tubercles, is still considered by many as incomplete, and as needing addition and support from further investigations. Dr. Gregory, among others, in the recent edition of his Elements of Medicine, adheres to the opinion that pulmonary tubercles "are situate not in the air-cells, but in the proper cellular texture of the lungs." The observations I am about to relate, in conjunction with some of those just referred to, have convinced me that pulmonary tubercles sometimes originate in the following alteration of the air-cells and their secretions. Antecedently to the appearances by which tubercles are commonly recognized, the air-cells in question become thickened and distended with morbid mucus. Their parietes continue to thicken, and their contents gradually solidify, till at last a total obliteration of their cavity is effected, and there result a number of solid, white or grey, more or less opaque bodies, frequently of rounded form, such as have received the appellations of miliary tubercles and miliary granulations.

In October, 1834, I witnessed the inspection of a subject whose lungs presented the following appearances. In the upper lobe of the right lung were several tough, grey capsules. Some of these were filled with matter which, at the circumference, was

very tough, black, and opaque; but at the centre, partly of a black, partly of a dirty-white colour, opaque, of a caseous softness, in some places minutely granular, held together by cellular substance. Other capsules were filled altogether with the soft matter last described. At the roots of the lungs were some similar masses, and also several capsules enclosing hard earthy nodules. One of the latter, however, had perforated both its cyst and the parietes of a large adjacent bronchus, and was projecting naked into its cavity. Very thickly disseminated through both lungs, were bodies considered by all present to be incipient tubercles. They were in general of a somewhat rounded or oval form, from the size of a grain of sand to that of a mustard-seed, some transparent and colourless, others whitish and semi-opaque; they felt hard and quite distinct from the adjacent pulmonary structure, as the finger was passed over them. On further examination, I found that each of these bodies consisted of a tough, nearly transparent cyst, filled with fluid, which in some was white, semi-opaque, thick and viscid, in others was thinner, transparent, and colourless. The neighbouring bronchi were filled with mucus of similar appearance, and in several instances a minute bronchus so filled could, on dissection, be distinctly seen to terminate in one of these vesicles. The bronchial mucous membrane in these parts was thickened; in some places white and semi-opaque, in others reddened and softened.

There could be no doubt that the tuberculoid bodies were continuous with the bronchi, were por-

tions of the air-passages: and thence I learnt that the terminations of the air-passages, the air-cells as they are termed, are liable to become thickened, dilated, and filled with thick mucus, and that they then assume an appearance nearly resembling that of tubercles both to the eye and to the touch.

All that was wanting to render these distended thickened vesicles identical with miliary granulations or miliary tubercles, was an obliteration of their cavities. That their cavities may sometimes be obliterated, either by an increased thickening of the parietes, or by gradual inspissation and solidification of their contents, is divested of all improbability by the frequency of such changes in the other canals and receptacles of the body: though, as* the texture, function, and circumstances of the air-cells are very peculiar, the precise nature of their lesions and their degree of liability to various diseases cannot be expected to be uniformly similar to those of any other structure. Obliteration of the serous and synovial cavities by secretions gradually concreting into thick solid masses and connecting their opposite surfaces, are among the most common of morbid appearances. Thickening of their parietes is no less so. The mucous canals are comparatively seldom obliterated by secretions: yet cases are not very rare, in which the bronchi are found choked up with what are termed bronchial polypi; and in a case of pulmonary tubercles and ulcerations of the colon, I found the appendix vermiformis enormously distended by a

* See Andral, Anat. Pathol. T. II. p. 462.

firmly adherent mass, which towards the circumference was white, opaque, quite solid, and disposed in concentric laminæ, towards the centre gradually losing its colour and consisting of a firm jelly intersected by cellular tissue. On the other hand, it is well known how frequently the urethra and certain parts of the alimentary canal are thickened, and the several tunics of the bronchi have been found so much so as to render their channels almost impervious. The thickened parietes of dilated bronchi are also converted sometimes into cartilage, thus presenting an analogy to the cartilaginous appearance of some tubercular granulations. The veins, arteries, and lymphatics, though less frequently examined, have been found obliterated both by thickening and by their secretions.

It was, therefore, rather the fulfilment of an anticipation than a matter of surprise, when some time afterwards cases came under my observation, in which there was a gradual transition from the thickened distended air-cells above described to the solid body which is termed miliary tubercle; and in which therefore the two could be identified as constituting different stages of the same disease. As my time has been too much subdivided to permit a very particular search for cases bearing upon the present point, I have only met with two which combined all the circumstances requisite to make the chain of proof complete. In these were presented the whole of the following series of particulars.

1. Excavations, principally at the apices of the

lobes, of the ordinary appearance of those which accompany tubercles.

2. White or yellowish, opaque or nearly opaque bodies, appearing in the section of the lung to have a somewhat rounded or oblong form, some nearly liquid, others of various degrees of firmness up to that of the pancreas.

3. Firm bodies differing from the latter only in having less colour and more translucency: many of those which at the circumference were very translucent and nearly colourless, having in the centre a small, yellow, opaque speck: others having a whiteness and tendency to opacity, slight towards the circumference, gradually increasing towards the centre. Some of these bodies, upon a minute examination, were found to be cylinders with a bulbous extremity, containing in some instances a yellow, opaque particle.

4. Bodies which did not to the eye differ from the preceding, some being nearly colourless and very translucent throughout, others of a whiteness and opacity gradually increasing towards the centre, the greater number of a somewhat rounded or oblong form: feeling hard also as the finger was passed over them while they lay in the lung. Upon a careful examination it was found that these consisted of membranes, of various thickness, of a white or greyish colour, filled with colourless or whitish, translucent, very viscid fluid, having all the appearance of mucus: and in numerous instances it was observed that the adjacent bronchi were filled with mucus of the same

appearance. Minute bronchi distended with this mucus could often be seen proceeding for a considerable distance, and at last terminating in one of the vesicles filled with a similar fluid. There could, therefore, be no doubt that the vesicles were portions of bronchi, or of the cells in which they terminate, greatly distended with mucus. Particles of yellow, opaque, friable matter were, in some instances, contained in the fluid which exuded from the vesicles. Some of these bodies, which at first had the appearance of being single vesicles, were, on a closer scrutiny, discovered to be clusters of smaller ones.

5. Bodies forming a transition between the third and fourth groups: in which the central cavity filled with mucus still remained, but had been greatly diminished by the concentric thickening of the parietes. These bodies, likewise, were in several instances much elongated, having all the appearance of minute bronchi thickened.

There appears no room for doubt that the vesicles and solid tubercles were but different stages of the same disease; that they equally consisted in an alteration of the minute air-passages, which at first became somewhat thickened and distended with their secretions, and were at last totally solidified, partly by the concentric thickening of their parietes and partly by inspissation of their contents.

While such may be inferred to be sometimes the origin of pulmonary tubercles, it cannot be supposed that the alteration of the air-cells, with which in these cases the affection commenced, invariably pursues

this fatal course. The point hardly admits of direct evidence. But it is probable from analogy, that while in some cases the state of the constitution is such as to render abortive all attempts to remove the affection, or to check its tendency to degenerate into tubercles and vomicæ, there are others in which the parts regain their natural condition.

This view of one of the modes in which tubercles originate may reflect some light on their etiology. The school of Bayle, Laennec, and Louis, refer them almost altogether to a particular vice of constitution. Others, while they allow that the complaint attacks those alone whose constitutions are predisposed, maintain that local agents have often a great influence, and excite the disease in many, who, though the diathesis existed, would otherwise have escaped. Of the latter, they consider a lingering inflammation of the air-cells and bronchi as among the most frequent and most powerful. But, though the symptoms first observed, and their reputed exciting causes are often those of bronchitis and peripneumony, it cannot be inferred that the tubercles were consecutive: they may have pre-existed, as they have often been found, where neither the patient nor his attendants had noticed any symptoms indicative of their presence. Little doubt will, however, be entertained that these inflammations may be instrumental in determining their production, if it be admitted that tubercles are often nothing more than minute bronchi and the cells in which they terminate, thickened and distended with morbid secretion; since this alteration is just

such as a lingering bronchitis might in some constitutions be expected to produce, and one which cannot with certainty be referred to any other mode of action. Our present conclusion affords, likewise, a more satisfactory explanation than any other, of the great frequency of pulmonary tubercles among those who breathe an atmosphere subject to vicissitudes, or contaminated with irritating vapours or particles.

It is, perhaps, in a certain number of cases only, that pulmonary tubercles have this origin. If so, future observations will probably point out in what other ways they may originate. When the constitutional and local circumstances which distinguish the several species of phthisis from one another are understood, and when the signs by which during life they may be discriminated are ascertained, each may be found to require a treatment in some respects peculiar to itself, and much of the seeming discrepancy which now subsists between the experience of different practitioners may thus be satisfactorily explained away.

III. It was formerly the opinion of the best observers that pulmonary phthisis was not unfrequently cured after ulceration had taken place. But the existence of ulceration in the cases cured was inferred from the presence of circumstances which at last were discovered to be often unconnected with it: and thence a general doubt arose, whether the reporters of these cures had not mistaken for ulceration of the lungs other affections of a less fatal character.

Laennec has lately adduced the evidence of dissection in support of the old opinion. He collected three cases within a few months, in which pulmonary excavations had been healed either by an adhesion of their opposite surfaces, or by the formation of a lining membrane similar to those which naturally protect the internal surfaces of the body; and in which, as there remained few or no tubercles in the earlier stages, the disease might be considered as nearly, or altogether at an end. But in these and a few similar cases since observed, a very small portion only of the lungs had been attacked. Hence Andral remarks, "Tout en reconnaissant que des excavations tuberculeuses peuvent se cicatriser, nous avouons que dans le plus grand nombre des cas, cette cicatrisation n'est guère utile au malade, en raison de l'existence simultanée d'un grand nombre d'autres tubercules. L'oblitération d'une caverne ne pourrait être avantageuse que dans les cas où il n'existerait qu'un seul tubercule, comme nous venons d'en rapporter un exemple; ou bien, si, consécutivement à la cicatrisation de la caverne, les autres tubercules, existant en petit nombre et entourés d'un parenchyme sain restaient stationnaires dans leur développement."* And Dr. James Clark, in his recent work, affirms that "No Physician acquainted with the morbid anatomy of phthisis can for a moment indulge the hope that we shall ever be able to cure what is usually termed 'confirmed consumption,' if we except the small proportion of cases in which the tuberculous

* Clinique Médicale.

deposit is confined to a very limited portion of the lung."

No instance has been recorded, and even by Laennec no instance has been contemplated as possible, in which a tuberculous affection, so extensive as to have disorganized the whole of one lung and a fourth part of the other, had been healed. Yet this is what had occurred in the following case.

A coachman, aged 49, was admitted into St. George's Hospital in August, 1834, for a wound on the calf of the right leg from the kick of a horse. It did not confine him to bed long, and was cured in about four months. He made no complaint of his chest to the surgeon who attended him; but from the nurses of the ward, and the patients who slept next to him, I learnt the following particulars. He had an occasional severe fit of coughing, with some expectoration in foggy weather, but was often not heard to cough for many days together: never complained of pain at the chest, palpitations or dyspnœa, but was observed, while speaking, to take breath rather oftener than was natural: never required to be propped up in bed, lay generally on the left side, though sometimes on the right and sometimes on the back: was angry when once it was hinted that he was asthmatic. He did not sweat at night: required rather more than the usual allowance of bed-clothes to keep him warm. He eat the whole of the "ordinary diet" with apparent appetite: used to be dressed and sitting up the greater part of the day, and for some time before he left the hospital could

walk three or four miles without fatigue or any ill effect.

Having in the beginning of January been discharged as cured, he, a few days afterwards, was drenched by a heavy shower, and on the 24th was brought back to the hospital, complaining of violent pain at the loins and hypogastrium, suppression of urine for two days, severe scalding whenever a few drops were passed, and a great itching at the glands. Five days afterwards there supervened severe headache, delirium, ptosis and strabismus of the right eye, with dilatation of the pupil. He died on the twelfth day of this last attack, during the whole of which he never coughed, nor made any complaint of his chest.

Sectio cadaveris, eighteen hours after death.—The surface was in general pale, the face, trunk, and lower extremities were slightly œdematous. There was no emaciation: the parietes of the chest and abdomen were moderately fat: the arms and thighs were well developed, the legs were not thinner than might be natural to a person of his occupation, and who had been inactive for five months. I noticed an old trace of venesection at the bend of each arm.

There was much serum on the surface and in the ventricles of the brain, the large vessels of which were distended. The kidneys presented the characters of severe recent inflammation, both of the cortical and medullary portions, and of the lining membranes of the infundibula, pelves, and ureters. The mucous membrane of the bladder was somewhat congested, its muscular tunic was thickened, and the prostate

gland contained lymph and pus. Thus much for the immediate cause of death.

The only other morbid appearances which, on a very careful examination, could be discovered in the abdomen were, some enlargement of the liver and spleen, and three or four very small ulcerations of the colon. A large quantity of fat was collected in the omentum and mesentery, in the appendices epiploicæ, and about the kidneys.

The left lung was loosely connected to the ribs and pericardium by a tough net-work containing a layer of fat from half to three quarters of an inch in thickness, and many inches in extent. The lung, when separated from this, was not larger than a moderate orange flattened; it had the breadth of the palm of the hand. The whole of the upper and part of the lower lobe was covered with a thick, reddish ligamentous membrane, from a line to a line and a half in thickness.

The lung had totally lost its natural sponginess, and was irregularly hardened. The upper lobe was entirely converted into a large excavation, with the exception of a rind which was in general from half a line to a line and a half in thickness, and no where exceeded three lines. This excavation was capable of holding above a quarter of a pint of fluid: it was slightly divided into three compartments by intersecting bands of pulmonary substance. In the lower lobe were two cavities of the size of small plums, and there were about a dozen as large as unshelled filberts, communicating with the former, some by large, others

by small apertures. They were in some places within a line of the pleura, but in no place were they in contact with it. There was about twice as much of the lower lobe remaining as of the upper: they were separated from each other by a tough, somewhat vascular, fibro-cartilaginous tissue, which in some places was nearly half an inch thick.

All these excavations and the bands which traversed them were lined with membrane which was smooth, thicker than the mucous membrane of the bronchi, semi-transparent, generally whitish, but in some instances reddish, having the firmness in some places of mucous, in others of fibrous membrane. Here and there were whitish or black elevated points, generally covered by the inner membrane. Underneath there was generally a second membrane, which was whitish, fibro-cartilaginous, of the thickness of writing paper: but in a few places it was not very distinct from the tissue external to it. I observed the mouths of several large bronchi, some of the diameter of writing quills, opening into the excavations nearly at right angles with their surface, so as to have the appearance of being cut short off. Their mucous membrane was gradually lost at the edge of the excavation. At the mouth of one of the bronchi was a relic of one of the corroded cartilages, making a pointed projection into the cavity of the excavation.

One or two of the minor excavations were partially occupied by solid, but friable, granular, nearly opaque masses, which did not adhere to the surface of the excavations, and were evidently the residue of old

tuberculous secretion, of which the fluid particles had been absorbed. The other excavations contained nothing but a slight mucous exudation; no puriform or tuberculous matter whatever.

What remained of the pulmonary structure of this lung was totally destitute of air, very tough, flabby, of grey or reddish brown colour. Each lobe contained six or eight tough, whitish, translucent capsules, of the size of pins' heads, filled with opaque, yellowish, minutely granular, dry matter, held together by cellular threads. There was also a small ramifying tube filled with the same matter. The bronchi and blood-vessels were generally much shrunk. The bronchi were lined with a reddish mucus, and their inner membrane was slightly reddened, and softened. A portion of one was dilated to four times the natural calibre: its lining membrane was similar to the rest, except that it was more reddened, and here and there gathered up into transverse ridges, very characteristic of bronchial dilatations.

At the right side of the chest the pleuræ were in a few places adherent by tough membrane, which, at the edge of the lower lobe, contained a mass of fat. The condition of the right lung differed widely from that of the left. It was larger than is usual. It contained no excavations whatever. About three fourths were perfectly healthy, except that a good many of the air-cells were enlarged. The remaining fourth was taken up with solid masses, disseminated in considerable numbers through the upper and middle lobes, very sparingly through the lower one.

Their size varied from that of a mustard-seed, to that of a filbert. There was one whitish, semi-transparent, firm tubercle of the size of a mustard-seed, which appeared to be contained in the thickened dilated extremity of a bronchus. A great many consisted of capsules filled with matter of different appearances. Their contents were in a few instances a congeries of granules, of the size of millet-seeds, of caseous consistence, generally yellow and opaque, but in one or two instances translucent and whitish, here and there appearing to be connected by a cellular web. In several instances their contents consisted partly of these yellow granules, and partly of harder black matter. Then there were five or six pea-sized capsules, filled entirely with black matter, of considerably more than caseous hardness. But the lung was still more thickly strewed with roundish black masses, some of woody hardness, without any investing membrane. One cyst contained a white, hard calculus. The pulmonary tissue around these masses was crepitating, and in all respects healthy. Some of the bronchi of this lung contained a whitish or reddish viscid mucus: and the cartilages at the divisions of some of the small bronchi were much thickened.

The trachea presented a healthy appearance, except that its follicles were somewhat unduly developed. The bronchial glands were of moderate size; some were black, and exuded an inky fluid. The heart was adherent to the pericardium at its base. There was a considerable quantity of fat on its superior surface and around its edges. Its size was

natural. Each of the left cavities could have held only about six drachms. The right ventricle was twice as large as the left, and the right auricle three times as large as the left auricle. At the upper part of the fossa ovalis there was a valvular communication between the two auricles, capable of admitting the little finger, and so formed as to permit the passage of the blood only in the direction from right to left: contiguous to this were a number of minor apertures, altogether equivalent in calibre to a crow-quill.

In this case the whole of one lung and a quarter of the other had been incapacitated by the disease. The tuberculous débris found in one or two of the minor excavations, and the remaining yellow, opaque, friable tubercles, few and encysted as they were, will be generally considered sufficient evidence of the nature of the lesion which had produced the excavations. The freedom of the other excavations from tuberculous and purulent matter, and the perfect and healthy appearance of all their lining membranes, shewed that they were no longer in a state of ulceration, and could now occasion no ill effects beyond what resulted from the loss of so large a portion of the respiratory organ, from a susceptibility common to newly formed membranes, and from the difficulty of ejecting any unusual secretion of mucus. The encysted state of the few tubercles which remained, proved that they had withered, and were incapable of exciting irritation. The carbonaceous masses into which those of the right lung had

for the most part been converted, are admitted to be nearly innocuous.

These inferences are corroborated by the absence of all habitual chest-symptoms, except the necessity of frequently taking breath while speaking, which the diminished capacity of the lungs for air rendered inevitable. The latter circumstance likewise enfeebled in some degree the power of generating heat; and must have induced some general weakness of constitution, and a predisposition to inflammatory attacks, such as that by which the patient was eventually carried off. The susceptibility of irritation with which newly formed membranes might be expected to be endued, was indicated by the coughing and expectoration in foggy weather: the paroxysms in which the coughing sometimes occurred proceeded from the difficulty of ejecting the mucus which on such occasions was secreted into the excavations.

The direct communication which existed between the auricles, though in some respects injurious, had in this case the advantage of helping to preserve the lungs and the venous system in general from the congestion which the diminished calibre of the pulmonary vessels tended to produce. The disappearance of that vice of constitution which is connected with tuberculous disease, was fully proved by the freedom from all tubercles in the ordinary conditions, notwithstanding that a fortnight before death a potent exciting cause had been applied,—by the quantity of fat which was accumulated in many parts of the body, and by

the constitutional vigour evinced in the recovery of health, flesh and strength, after so severe a wound.

Although there sometimes exist marks which satisfactorily indicate the healing of pulmonary tubercle, it is far more common to meet with appearances which, though they may often have had a similar origin, want the peculiarities necessary to distinguish them from the vestiges of other diseases. Unless the symptoms during life have been very characteristic, the nature of such cases is left in doubt. When it is considered for how few years these traces of past disease have been understood or attended to, how often they are ambiguous, and how liable to be overlooked, it will not appear unlikely that the proportion of cases in which pulmonary tubercles are actually healed is many times greater than the proportion in which the cure has been demonstrated.

OBSERVATIONS

ON

SOME OF THE FORMS

OF

ATROPHY OF BONE.

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As the elementary particles of which the body is composed are undergoing a continual change—as parts are constantly being removed, and fresh matter as unceasingly deposited in their stead, we are led to infer, that the normal condition of the whole, or of its several parts, must essentially depend upon the maintenance of a proper relation between these two actions. During the period of growth, the deposition is more active than the removal; at puberty, the balance is about equal; whilst in the decline of life, the supply being less, more is taken up than is compensated for by the powers of repair. If, then, a part obtains an abnormal increase in size, without any other alteration in structure and organization, it would appear to indicate an excess of the powers of nutrition. On the other hand, a preternatural wasting

or decay, seems to denote a defect of the same powers. And these changes, which the French Pathologists express by the terms, "Hypertrophy," and "Atrophy," are as clearly proved to be the result of a morbid alteration in nutrition, as the effusion of lymph, or pus, to be the product of the process called inflammation, and are, therefore, equally entitled to be considered true pathological conditions. The term Atrophy, strictly speaking, should denote only such changes as are proved to be consequent upon defective nutrition, but I propose to employ it here to express all those changes evinced by loss of substance, unaccompanied with any alteration in texture or organization, and without any reference whatever to the morbid action that produces it, since in the majority of cases it is impossible to determine with accuracy, whether the loss is the result of increased absorption, or of defective nutrition. And we find it in the osseous system, as in soft structures, under circumstances which seem to indicate that it may be caused in both these ways.

Several forms of atrophy of bone have been long familiar to Pathologists, and are accurately described; others, however, which are but imperfectly understood, or have not hitherto been noticed, will be the objects of inquiry in this paper.

Atrophy may occur in the bones generally, or may be limited to certain bones, or to particular parts of bones, and it may be expressed by a deficiency of the earthy particles alone, or by a diminution of all the constituents.

Local atrophy is generally found to be induced by pressure or friction, being often remarked in bones obstructing the growth of cystic, aneurismal, or other tumours. As, in these cases, vascular structures waste faster than those less highly organised, it is most probable that the process is one of absorption, those parts being more rapidly removed which are best supplied with the active agents that carry off their molecules. In atrophy from pressure, the animal and earthy constituents are removed equally and together. Although this form is too well known to need any illustration, the following case is adduced as an uncommon variety and as being of considerable interest in surgical pathology.

CASE.

Partial dislocation of the os humeri forward beneath the pectoral muscle.—Atrophy of the head of the bone, and inner edge of the glenoid cavity of the scapula.

A German labourer, twenty-seven years of age, had applied at the London Hospital as often as fourteen or fifteen times on account of repeated dislocations of the right humerus beneath the pectoral muscle. The bone had been generally replaced without difficulty, and on several other occasions had returned without surgical assistance. Various mechanical contrivances were resorted to in order to confine the bone to its natural position, but none were of any service, and the bone was so often displaced by the least muscular exertion that he was unable to continue at work.

On the last occasion that he applied, in August 1835, the dressers experienced great difficulty, and although they employed the pulleys, were unable to reduce the dislocation. As he was sitting, however, in a chair, somewhat exhausted by the efforts that had been made, the bone suddenly slipped into its place. About a fortnight afterwards he was seized with convulsive fits, became insensible, and died in two days.

On examining the shoulder, the muscles were found healthy and well developed. There was a false socket beneath the coracoid process, at the inner edge of the glenoid cavity, in front of the neck of the scapula, and bounded by the tendon of the sub-scapularis muscle, in which there was considerable bony deposit. The head of the humerus was greatly altered in shape, being of an oval form, and its long diameter being in a line with the axis of the bone. About one-fourth of it, together with the connecting cartilage, had been removed so evenly that the head appeared as if a section had been made of it. The inner edge of the glenoid cavity, with its cartilage, was also in great part removed. The portions of bone thus exposed were even and slightly polished. The capsular ligament was smooth internally, apparently enlarged, and loose, and the tendons of the two heads of the biceps natural.

This remarkable atrophy was doubtless occasioned by the friction to which the head of the humerus had been subjected in its play from the natural to the false socket, and operated most efficiently as a bar to

the bone being subsequently retained in its right situation during the motions of the joint. A like alteration in the head of the os humeri is related in Sir A. Cooper's work on Dislocations, to have been found in a subject brought for dissection to St. Thomas's Hospital, with an unreduced dislocation of this bone. No history was attached to it, so that the change is unaccounted for. Mr. Stanley has shewn me three similar preparations contained in the Museum of St. Bartholomew's Hospital, in which, however, the atrophy is not so far advanced. They were also taken from subjects in the dissecting room and are without any history. In these, as in the preparation figured in Sir A. Cooper's work, there is a new glenoid cavity immediately beneath the coracoid process.

Local atrophy is sometimes the result of an injury, being produced by an action different from that commonly known by the term caries. A highly interesting example of local atrophy of a small portion of the cranium, following a contused wound, has been lately described by Mr. Travers, in the first volume of the St. Thomas's Hospital Reports. Instead, however, of being limited to a part of a bone, or to the seat of injury, atrophy may be occasioned in the entire bone from this cause, so that, without any evident alteration in external configuration, by a change affecting both hard and soft particles, the bone may be rendered smaller and of diminished weight. This, in order to denote the direction of the wasting, and to distinguish it from another form, may be correctly

termed *concentric atrophy* of bone. Cheselden, in his Osteographia, has figured the two thigh bones of a soldier shot in the right groin at Gibraltar, who, on returning home the following winter, died soon after of dropsy. The right femur is represented very much wasted as compared with the left, and it is stated to have been less than half the weight of the other *.

In what way an injury operates in giving rise to atrophy of bone, where there is no appreciable lesion of the blood vessels or nerves going to them, is not satisfactorily explained. In Cheselden's case, it is attributed by the late Mr. Shaw † to want of exercise, but the wasting had taken place to too great an extent in a short time to be accounted for in this way alone, and it is not mentioned that the other bones of the limb were similarly affected. Such examples, however, of atrophy, are undoubtedly rare, for after injuries, bones have a tendency to undergo other actions than those evinced by mere defective nutrition.

The bones, as well as the soft structures, fade and waste away when their activity is diminished or their functions suspended. This is seen in the bones of stumps after amputation, and in the bones of anchylosed limbs. In the new Museum adjoining the Ecole Pratique at Paris, founded by Dupuytren, there is a remarkable skeleton of an adult in which all the bones in the body are anchylosed, excepting

* Plate 50, fig. 1 and 2.

† Shaw (John), on the Nature and Treatment of the Distortions of the Spine, p. 8.

the lower jaw and the bones at the shoulder articulations. The bones of the extremities are very much atrophied, the thigh bones being scarcely larger than an ordinary radius. Examples of this kind, however, are sufficiently familiar to pathologists.

Bones likewise waste in common with other tissues when deprived of nervous influence. I witnessed a striking illustration of atrophy of the inferior extremities from this cause in the course of last summer. Two men in good health, with muscles well developed, were brought to the London Hospital, about the same time, with fractures of the spine about the last dorsal vertebra. One recovered with total loss of motion in the lower extremities. The other lost both sensation and motion. At the end of four months there was a very notable difference in the extent of atrophy which the inferior extremities had suffered in the two cases. In the first, there was certainly a marked alteration in the condition of the muscles, yet the degree of atrophy which they had undergone bore no comparison to that remarked in the wasted and attenuated limbs of the other. The subject of this second case died at the expiration of five months, and a fracture was found traversing the twelfth dorsal vertebra with such displacement as to occasion nearly complete obliteration of the spinal canal. The extreme lightness of the lower limbs was the subject of remark by all, but the friends of the deceased would not permit an examination of the bones. Lobstein records the case of a man who died at the age of fifty-four, with extreme atrophy of the right leg,

which appeared to be consequent upon a fall received when he was a child, and by which the sciatic and crural nerves were severely injured. On examination, both the soft parts and the bones of the paralysed limb were found reduced to a remarkable state of atrophy. The right thigh bone was found to weigh little more than three ounces, whilst its fellow weighed nearly double; and the gastrocnemius and soleus of the sound limb weighed nearly four times as much as the corresponding muscles on the atrophied limb*. Mr. Travers mentions a case in which union between the ends of the bones of a fractured leg, that was paralysed from fracture of the lumbar vertebræ, failed to proceed, whilst the extremities of the humerus, fractured at the same time, united perfectly in the usual period†. This, though not an instance of atrophy, is adduced in connexion with this subject to shew the influence of the nervous system over the actions of the capillary vessels.

Atrophy is observed to be an effect of a diminution in the normal supply of blood, but I am not aware that any example has hitherto been pointed out of bone wasting from this cause. The soft parts in which it has been generally remarked are, the testes, spleen, and kidneys, organs supplied chiefly by a single artery. In a man who died in the London Hospital in June last, of inanition consequent upon scirrhous disease of the lumbar and mesenteric glands, both renal and capsular arteries were nearly

* Traité d'Anatomie Pathologique.

† Further Inquiry concerning Constitutional Irritation, p. 436.

obliterated by the encroachment and pressure of the hardened mass, the effect of which upon the kidneys was a remarkable atrophy of their cortical structure, but little trace of which remained. It was a knowledge of the consequence of thus diminishing the supply of blood to an organ, that first led Sir W. Blizard to propose tying the thyroideal arteries in cases of bronchocele, an operation which has, in several instances, been followed by a wasting of the enlarged thyroid gland. It has been proposed, however, to apply this operation to other growths, and the main artery of a limb has been secured in the expectation that, by diminishing vascularity, a tumour situated beyond would fade, but the operation was found to fail in producing this result. It has, likewise, been found that interrupting the direct current of blood offers no impediment to the union of fractured bones, for in a case of fractured femur, accompanied with injury to the popliteal artery, although the femoral artery was tied, the fracture is stated to have been soundly united in six weeks*. These cases do not shew that lessening the quantity of the circulation in a part is inadequate to produce atrophy, but that when the main artery of a limb is tied, a collateral circulation is so freely and rapidly established that the parts beyond are very soon as well nourished as they were before. The operation, therefore, for diminishing the circulation, in order to arrest the increase of tumours, is only applicable to such growths

* Travers. Further Inquiry concerning Constitutional Irritation, p. 436.

as are supplied by two or three large arteries which admit of being secured immediately as they enter the diseased structures.

Whilst reflecting upon the mode in which nutrition is maintained in the osseous system, I was induced to inquire whether some of the bones might not, in consequence of accident or disease, sometimes be placed in this condition, that is to say, with their circulation interrupted at the point where the vessels are about to enter their structure. The long bones are observed to be supplied with blood by two orders of vessels. One set, after ramifying in the periosteum, penetrate the bone, and are distributed to the outer and more compact texture; the other set are derived generally from one trunk, termed the nutritious or medullary artery, which enters the bone by a distinct foramen and supplies the internal reticular tissue and medullary membrane, being supposed to secrete the medulla. Now it occurred to me, that in fracture of these bones one part must have the supply which it derives from the nutritious artery entirely cut off; and although both orders of vessels communicate freely with each other, yet the minute canals, through which the external or periosteal pass, being of a dense unyielding nature, these vessels must be prevented from undergoing that rapid increase in size, which, in the soft structures, constitutes so efficient a provision for a due circulation. I accordingly examined sections of fractured cylindrical bones, in order to ascertain if the ends which had been deprived of their normal supply of blood from the nutritious artery, underwent a corresponding de-

gree of atrophy. In nearly all the specimens which were first examined, I was agreeably surprised in finding my previous reasoning fully borne out. Thus, in femurs fractured below the entrance of the nutritious artery, I found the interior cavity of the inferior extremity enlarged, the cancelli expanded, and the walls thinned, a form of atrophy which I propose to distinguish by the term *eccentric*. A like alteration was also observed in fractured tibiæ, whilst in a humerus, broken near the middle and somewhat above the entrance of the nutritious artery, the upper portion was the seat of this change.

As far as I can ascertain, this interesting point in the pathology of the osseous system has been hitherto unnoticed, a circumstance which appears somewhat remarkable, when it is recollected how much labour has been expended, and how many experiments have been made in the investigation of the mode of union after fracture. It will be evident, that the division of a bone thus situated—with its circulation diminished and actually wasting in consequence, must be in a condition most unfavourable to unite, and we see, therefore, in the provisional callus, described by Dupuytren, a wise provision for the security of the limb until the circulation in the disconnected bone is re-established, and the vessels are enabled to take on the actions necessary for a more perfect union.

This wasting of the osseous tissue in that part of a fractured bone, deprived of its usual supply of blood from the medullary artery is not *constantly* met with, and if the explanation, which attributes it to defective

nutrition be found correct, we should expect that atrophy would not be observed under the following circumstances:—

1. In bones recently fractured: because the process by which atrophy is accomplished must necessarily be gradual, hence some time must elapse before it will be perceptible.

2. In bones long united: because a collateral, if not the regular circulation is subsequently though not immediately established, by which means the previously existing lesion would have been repaired. In old persons, and in those of weak powers, the circulation may never be completely reinstated, in which case the atrophy will be permanent.

3. In bones fractured during the period of growth: because the circulation in bone, as in other structures being at this time more active, the vessels being larger and more numerous, and the canals, through which they enter the osseous tissue, less dense and but imperfectly formed, the circulation is re-established before any visible degree of atrophy can ensue.

The observation, that eccentric atrophy frequently occurs in one of the divisions of a bone after fracture *,

* Another circumstance which must prevent *eccentric* atrophy from being a *constant* result of fracture, is a certain variation to which the nutritious arteries are subject. In some instances, instead of one artery entering the femur towards the superior part of the linea aspera, there is an additional vessel entering below the middle of the bone of larger size even than the superior. There are also occasional variations both in the number, size, and situation of the nutritious vessels of the humerus. In the tibia I have rarely found any variety.

and that that division is generally, if not invariably, the one deprived of its supply of blood from the nutritious artery, is undoubtedly well sustained, in proof of which I refer to the following preparations in different collections.

Collection at St. Thomas's Hospital:

Nos. 789 and 793. Sections of a femur united after fracture about its middle.—Very distinct atrophy of the inferior portion.

No. 790. Section of a femur united after a fracture below its middle.—Very distinct atrophy of the inferior portion.

No. 769. Section of a femur united after an oblique fracture about its middle.—Distinct atrophy of the inferior portion.

No. 791. Section of a femur united after a fracture below its middle.—Slight atrophy of the inferior portion.

No. 792. Section of a femur united after a fracture at its lower extremity.—Atrophy of the inferior portion.

No. 800. Section of a humerus united after an oblique fracture rather above its middle.—Distinct atrophy of the *superior* portion.

No. 781. Section of a tibia united after a fracture below its middle.—Slight atrophy of the inferior portion.

Collection at Guy's Hospital:

No. 1265^{b}. Section of a tibia badly united after a fracture at its lower extremity.—Distinct atrophy of the inferior portion.

No. 1282. Section of a tibia and fibula united after fracture, from which the earthy matter has been removed.—Very distinct atrophy of the inferior portion.

No. 1261. Section of a tibia united after fracture.—Atrophy of the inferior portion.

No. 1264. Section of a tibia united after fracture.—Slight atrophy of the inferior portion.

Nos. 1278 and 1279. Sections of a tibia united after fracture at its lower extremity.—Atrophy of the inferior portion.

Nos. 1203 and 1204. Sections of a femur united after an oblique fracture.—Indistinct atrophy of the inferior portion.

Collection at St. Bartholomew's Hospital:

H. 69. Sections of a femur united after a fracture below its middle.—Distinct atrophy of the inferior portion.

H. 7. Sections of a femur united after a fracture below its middle. —Distinct atrophy of the inferior portion.

Collection at the London Hospital:

G.$^{b.}$ 11. Sections of a femur united after a fracture a little below its middle.—Slight atrophy of the inferior portion.

G.$^{b.}$ 25. Sections of a femur united after a fracture just below the entrance of the medullary artery.—Indistinct atrophy of the inferior portion.

Collection at the London College:

No. 190. Section of a femur united after fracture.—Atrophy of the inferior portion.

——— Section of a tibia united after fracture.—Distinct atrophy of the inferior portion.

Collection at King's College:

——— Section of a femur united after fracture.—Atrophy of the inferior portion.

Mr. Langstaff's Collection:

No. 368. Section of a humerus after fracture about two inches below its neck.—Atrophy of the *superior* portion.

No. 1096. Section of a femur united after fracture about its middle.—Atrophy of the inferior portion.

In the collection of morbid specimens belonging to Mr. R. R. Robinson, there is a section of a tibia united after an oblique fracture about its middle, from a man aged forty-two, who died of some internal disease two years after the accident, in which there is distinct atrophy of the inferior portion*.

* In that splendid publication, the Museum Anatomicum Academiæ Lugduno-Batavæ descriptum, by Sandifort, there is a Plate (lxxxi. fig. 3, vol. 1.) representing a section of an united

These examples constitute the majority of the specimens of fractured bones in the Museums in London, of which sections have been made, and are amply sufficient to prove that the *eccentric* atrophy was not accidental, but depended upon some uniform cause. In some of them, it is true, the appearance may possibly be deceptive, in consequence of enlargement of the other division of the bone from periosteal inflammation, but the instances are too numerous, too often confined to one division, and the atrophy too evidently *eccentric*, readily to admit of error. In several sections where this was not remarked, it was obvious from the continuity of the cancellated structure and medullary canal, that the patient had survived the fracture for some length of time, a period, no doubt, sufficient to admit of the establishment of an adequate circulation, and the repair of the wasted part of the bone*. In other instances, in which the fracture had traversed the foramen through which the medullary artery passes, and in which no difference in the condition of the two divisions could be remarked, the outer shell was so thin, and the medullary cavity so much enlarged, as to render it highly probable that, the supply of blood from this vessel having been cut

fracture of the femur, in which atrophy of the inferior portion may be very distinctly seen.

* It is to be regretted that nearly all the specimens that have been mentioned are without any kind of history. There is no account of the ages of the subjects from which they were taken, nor any record of the period that had elapsed since the occurrence of the fracture.

off from the two portions by the nature of the injury, they had both undergone eccentric atrophy. But not being able to ascertain the age of the individuals at the time of death, and not having the fellow bone to compare with the injured one, it was impossible to determine this point satisfactorily.

The absence of ossific action, consequent upon a diminished supply of blood, is regarded by Sir A. Cooper, as the principal reason for the want of union after a fracture of the neck of the femur within the capsular ligament. I believe this is the only example of bone suffering from a diminished circulation which has hitherto been noticed. Sir A. Cooper remarks, "that the neck and head of the thigh bone are naturally supplied with blood by the periosteum of the cervix, and that when the bone is fractured, if, as most frequently happens, the periosteum be torn through, the means of ossific action are, in consequence of such fracture and laceration, necessarily destroyed in the head of the bone. Scarcely any change, therefore, takes place in the head or neck of the bone attached to it: no deposit of cartilage or bone, similar to that of the other fractured bones, is produced; but the deposit which does take place, as will be seen in the plates of fracture of the neck of the thigh bone, consists of ligamentous matter, covering the surface of the cancellated structure with little patches like ivory on the head of the bone." Sir Astley states, that on dissection after these injuries, "the cancellated structure of the broken surface of the head of the bone, and of the cervix, is hollowed

by the occasional pressure of the neck attached to the trochanter, and consequent absorption." The head of the femur, however, is not only liable to the change just described, but it very frequently undergoes a marked diminution in size, as might be demonstrated by reference to numerous preparations, and at page 106, Sir A. Cooper mentions that he divided the neck of the thigh bone in a dog, and the head of the bone was three-fourths absorbed.

In the head of a femur separated at its neck, within the capsular ligament, the periosteum being torn, the circulation is diminished to a greater extent than in other descriptions of fracture, where one division of the bone is deprived of its nourishment from the medullary artery. The loss, moreover, is not limited to its more central structure, but the whole of the detached bone sometimes suffers, and the atrophy, instead of being merely *eccentric*, occurs throughout its texture, not only the cancelli enlarging, but the size of the head becoming insufficient to fill the acetabulum. In this case there are other causes operating in favour of its progressive decay, as a prolonged cessation of the due exercise of its function, and friction against that portion of the neck connected with the trochanter.

The question respecting the mode of union after fracture of the neck of the femur within the capsule, is now completely set at rest, and although a bony union is admitted to be possible, its rarity, as well as the subsequent atrophy of the disconnected head, have been well accounted for by Sir A. Cooper, on

grounds which afford the strongest support to the view that has been taken of the cause of the *eccentric* atrophy of that part of a cylindrical bone accidentally cut off in cases of fracture from the nourishment that it derives from the medullary artery *.

It might be supposed that the supply received from the medullary artery being so small, and the communication with the other set of vessels so free, the bone could hardly be expected to suffer. But if we take the sum of the circulation received from the vessels of the periosteum, the amount of the supply derived from the nutritious artery would scarcely be deemed to bear a less proportion to that received from other sources, than 1 to 4. Now, that atrophy of the osseous tissue should be occasioned by a loss of nutrition, to this extent, will not be considered surprising, when it is recollected that in the case of the enlarged thyroid gland, on intercepting the supply from one only of its four large arteries which anastomose most freely, a temporary, if not a permanent, atrophy is the result, although here, there is not as in bones, any firm unyielding canals to resist the enlargement of the vessels communicating in its interior.

* I am aware that the nutritious artery is considered by some anatomists as destined simply to secrete the medulla; but the facts established in this paper, taken in conjunction with the interesting views of M. Berard, (Vide Archives Générales de Médecine, Février, 1835,) respecting the connexion that subsists between the union of the epiphyses to the shaft of the bone, and the direction of this vessel, clearly demonstrate that it is concerned in the nutrition both of the osseous tissue and of the medullary.

In the few wet specimens which have been examined, no alteration could be perceived in the medulla, or its membrane. In no form of *eccentric* atrophy of the osseous system is there any defect of this secretion, but the reverse, just as we find in atrophy of the internal organs, excepting the brain, that the void is usually filled up with adipose tissue.

The numerous pathological inquiries which have been instituted, in reference to the condition of the neck of the femur, seem clearly to indicate two facts, 1st, That this portion of the femur is less capable of maintaining its vascularity than the other parts of the osseous system, and 2dly, That the universal decay of the bones, natural to advanced age, first commences in it. The atrophy of old age is chiefly *eccentric*, the cancelli and medullary cavity first enlarging, and the outer shell subsequently becoming thin, and it is attended with an increased deposition of medulla*. In some cases the earthy parts are removed before the animal tissue, which accounts for the head of the femur sinking down upon its shaft and becoming altered in figure. More commonly, however, the texture remaining is brittle, possessing a more abundant share of calcareous matter than at

* M. Ribes, who has carefully examined the changes which the osseous system undergoes in old age, observes, that the internal spongy tissue of the flat bones gradually diminishes, and the two outer plates approach until they constitute but one plate, which bends under the finger, and is sometimes even replaced by a kind of ligament.—Bulletin de la Faculté de Paris, (ann. 1819, No. 11.)

the adult period, so that the external form and size of the bone is preserved, and, instead of yielding to pressure, they break on the application of the slightest force. In either case, however, the bone weighs less than at the adult period*.

A change, very similar to that noticed in the head of the femur, as the result of the eccentric atrophy of old age, attended with softening, sometimes takes place in the head of the humerus. But as this bone is attacked at a later period, and is subjected in a much less degree to the influence of pressure, the depression and alteration in figure are by no means so remarkable as in the femur. A good specimen, illustrating this change in the head of the humerus, is contained in the collection of morbid specimens at the London Hospital†.

There is one species of *eccentric* atrophy of bone of such rare occurrence that the records of our profession scarcely furnish twenty well marked examples. Few medical men in the course of a long practice meet with more than one or two instances of the disease in its advanced stage, and many surgeons of experience have never witnessed a case. The study of such unusual affections may be of little practical importance, but in a pathological view they are often of interest, and sometimes throw light on other

* Tenon has calculated that the bones of the skull diminish in weight from the adult period to old age, 250 gramm. 18 centigr., which, as he estimates the weight of the skull in the adult at 624 gramm. 22 centigr. makes a loss in its weight, from atrophy, of more than one-third.—Mém. de l'Institut. t. i. p. 221, an. iv.

† Vide Plate 5.

diseases of less rarity. The disease in question is commonly known by the name of mollities ossium; and in such paucity of data relating to it, it becomes perhaps a duty in medical men to give publicity to any examples that may come under their observation, especially as it has hitherto baffled all the means that have been employed for its relief. The following case occurred at the London Hospital three years ago; my account of it, I find, has already been incidentally noticed in print, but the particulars have never been wholly published.

CASE.

Eccentric Atrophy of Bone, or Mollities Ossium.

Catherine Burne, aged 72, was brought to the London Hospital from the workhouse at Poplar, February 18th, 1833, in consequence of a fracture of the right femur. She had been an inmate there since the 18th of September 1827, and had been bedridden for nearly four years on account of paralysis of the lower extremities. The hip and knee joints had been in a state of flexion so long that it was impossible to straighten them, and for some years she had experienced great pains in the knees and thighs. She had been subject to hysteric fits, also to a slight cough, and ever since her last confinement had been troubled with incontinence of urine, in which secretion nothing peculiar had at any time been remarked. Her appetite had always been good. On being turned in bed by a nurse on the morning of the day that she was sent to the hospital, her right thigh was suddenly fractured. About a fortnight after her admission,

whilst being moved in bed, her right humerus was also broken. The arm was placed in splints, but from this time she gradually sunk, and died on the 19th of March.

On examining the body, the lungs, abdominal viscera, and mesenteric glands, were found healthy, but the heart was rather flabby. There was considerable calcareous deposit in the lumbar and iliac glands, and a fistulous communication between the vagina and bladder. Between three and four ounces of serum escaped from the cavity of the arachnoid; and between the layers of that part of the dura mater covering the upper surface of the brain, some tubercles were found. All the articulations were in a healthy state. The periosteum was every where normal, except over the trochanters, where it was entirely detached, owing, most probably, to inflammation induced by the pressure to which they had been so long subjected. The bones of the skull and pelvis might be cut with a strong knife, but the ribs and vertebræ were only slightly affected, being scarcely less firm than usual. The femur consisted of a thin shell of bone filled with medulla, its cellular structure being entirely obliterated, except in the head of the bone and at the trochanters, where there was a slight appearance of cancelli greatly enlarged. Some dark spots were observed at different parts of the interior, which were found to be produced by extravasated blood. The fractured extremities of the right thigh-bone had a slight ligamentous connexion. The tibia also consisted of a mere shell of bone, elastic, and

yielding under the finger like a thin piece of ivory, the cancelli being removed and the interior likewise filled with medulla. Although only a thin lamina of bone remained at their extremities for the attachment of the articulating cartilage, that structure was not in the slightest degree affected. The tarsal and metatarsal bones and the bones of the phalanges of the toes were much less firm than in the natural state, and their cellular texture enlarged. The humerus was firmer than the thigh-bone; it did not yield to pressure, and in order to make a section of it, the use of a saw was necessary; whereas all the bones of the lower extremities could be readily cut with a knife. The walls, however, of the bones of the superior extremities were preternaturally thin, and their medullary cavities evidently enlarged. Upon making sections of the different bones, patches of a light red colour were remarked at different parts, and these, upon inspection with a magnifier, were found to arise from the minute vessels of the medullary membrane being highly injected with red blood. The oily substance with which the bones were filled closely resembled the medulla of an old subject, and several of the bones having been placed for some months in water to macerate, it was converted into adipocire, a beautiful specimen of which was afforded by a section of the humerus.

It is to be regretted that it was impossible to obtain a fuller account of her state of health and of the condition of the different secretions at an earlier period of the disease.

The following is a Table of all the Cases of the disease on record of which I have been able to meet with a clear account; and the facts that they collectively furnish may admit of some correct inferences respecting this curious affection.

TABLE:—Shewing the Sex, Age, and Authority, in Sixteen Cases of Mollities Ossium.

No.	Name.	Sex.	Age.	Authority for the Cases.
1	.....	F. mar^{d}.	32	Gabriel.—Eph. Dec. 3. Ann. 2. Obs. 3. p. 7.
2	.....	F.	30	M. Saviard, Nouveau Recueil d'Observations Chirurgicales faites par. Paris. 1702. Obs. 62. p. 274.
3	.....	F.	21	M. Courtial. Histoire de l'Academie Royale des Sciences. Année 1709.
4	.....	F.	40	Mr. Sylvanus Bevan. Phil. Trans. Vol. 42. p. 488.
5	Madame Supiot	F. mar^{d}.	31	M. Morand. Memoires de l'Academie Royale des Sciences de Paris. Année 1753, p. 543.—Bromfield's Chirurgical Observations and Cases, 1773. Vol. II. p. 30.
6	Mary Hayes	F. unm^{d}.	35	Gooch. Practical Treatise on Wounds and other Chirurgical Subjects. Norwich, 1777. Vol. I. p. 39.
7	.....	F. mar^{d}.	45	M. Saillant. Histoire de la Societé Royale de Medecine. Année 1776, p. 316.
8	Mary Bradcock	F. mar^{d}.	32	W. Goodwine. London Medical Journal. Vol. VI. p. 288.
9	.....	F.	40	Wilson. Lectures on the Structure and Diseases of the Bones and Joints. Lond. 1820. p. 254.
10	.....	F. unm^{d}.	35	Howship. Edinburgh Medico-Chirurgical Transactions. Vol II. p. 136.
11	Josephine Thevenot	F. mar^{d}.	25	M. Roberty. Archives Générales de Médecine, 1834. p. 435.
12	.....	F.	61	———. Medico-Chirurgical Review, 1836. p. 254, extracted from some French Journal.
13	Catherine Burne ...	F. mar^{d}.	72	The Author.
14	Edward Cass	M.	38	Anonymous. Gentleman's Magazine for August, 1748.
15	James Stephenson ..	M.	33	H. Thompson. Medical Observations and Inquiries. Vol. V.
16	—— Pouble	M.	—	M. Saillant. Histoire de la Societé Royale de Médecine. Année 1786. p. 96.

It will be perceived by this table, that in sixteen instances three only were males; that in eleven the disease proved fatal from the age of thirty to forty; that in no case has it appeared before the age of puberty, and in only two after the age of fifty: Cases 12 and 13 being the only examples of its occurrence in old age. As far as could be ascertained from the records, most of the females had borne a family; several of them having been delivered during the progress of the disease*.

In most of the cases, it is noticed, that the various functions were duly performed, unless interfered with by the distortion consequent upon the yielding of the bones; and in Cases 1, 2, 3, 4, 5, 6, 7, 11, 14, and 15, it is distinctly stated, that the internal organs were found in a healthy condition after death, shewing that the disease is not associated with any particular lesion of important viscera.

The progress of this affection of the osseous system varies greatly, the bones becoming atrophied, in some instances, in a few months, as happened in Cases 1, 2, and 11. More commonly, however, the disease is extremely chronic, going on for many years before the death of the patient, as in Cases 4, 5, 6, 7, 8, 10, 14, 15, and 16.

* There is a skeleton in the collection of the College of Surgeons in Edinburgh, where the spine, thorax and pelvis are greatly distorted by this disease, taken from a female who had seven children, each labour having been accompanied with increased difficulties and the death of all the children, except the last child, whose life was saved by the performance of the Cæsarian section, which operation, however, proved fatal to the mother.

It is nearly always accompanied with pains of a severe character, which are often supposed to be rheumatic. These pains are evidently not the result of the distortion or fracture, but always precede them, and in some instances, as in Cases 5 and 8, the bones about to be attacked were distinctly announced by the locality of the previous pains.

The pathological condition of the bones in this disease corresponds more or less with the account that has been given of them in the case of Catherine Burne, the chief variations being dependent upon the extent to which the disease had advanced at the time of death. The only other good specimens in preservation that I have met with, are—a section of an injected humerus, from the patient in Case 8, contained in the Hunterian collection (No. 603); a section of the lower end of a femur from a female, who died at the age of sixty-one, in the museum of Guy's Hospital; and a section of the femur from Case 10, preserved in the museum at Fort Pitt, Chatham. It will be readily seen on examination of these specimens of the disease in various stages, and from the description of the state of the bones in the Cases 4, 6, 9, 10, 11, and 12, that the atrophy is *eccentric*, commencing invariably from the interior of the bones: in the long bones, affecting first the internal part of the shaft or more dense and compact part of the osseous tissue, and subsequently extending to the vascular cancellous extremities, until, if the patient survives, no part of the proper osseous structure remains, its place being supplied by an increased

secretion of medulla, invested and retained *in situ* by the periosteum. In the flat bones the diploe first becomes affected, and the atrophy goes on in like manner from within outwards, until the two external tables are entirely destroyed, and nothing but the medullary tissue remains. In the majority of instances the atrophy commences first in the bones of the lower extremities, and extends afterwards to those of the upper and of the trunk, so that eventually, no part of the bony system escapes.

The teeth have never been known to become affected in this disease, affording another argument in favour of the view which regards them as independent of the laws that regulate the osseous system.

It is remarkable, that even in the most extreme cases of this disease no change is produced in the articulating cartilages nor in the periosteum, with the exception of a little thickening occasionally observed in the latter. In Case 16, the long confinement appears to have led to atrophy of the cartilages and anchylosis of the patellæ, also of several of the vertebræ and bones of the carpus.

The muscles usually undergo more or less atrophy, as might be expected from their remaining so long useless; and in Case 12 it is mentioned, that fat was deposited in their substance, as also in the structure of the nerves.

It at first sight appears surprising, that in the same form of disease the atrophy should in some instances be attended with the utmost distortion without the oc-

currence of a single fracture, as in the extraordinary case of Madame Supiot, in which the feet "lay on each side of the head, and would even pass behind it;" whilst in others, though less advanced, the bones are broken by the slightest force, as in Cases 2, 8, and 14, although no distortion takes place, except such as arises from the displacement of the ends of the fractured bones. But this depends solely upon a slight modification in the wasting process—upon the more or less rapid decay of the earthy parts, as compared with that of the animal constituents, Thus, when the earthy parts waste faster than the softer structures, there is distortion without fracture; but, on the other hand, when the animal parts waste more rapidly than the earthy materials, then there is fragility without distortion. In some cases, however, there is fragility in the first instance; and afterwards; when the disease is further advanced, distortion. That this is the true explanation of these variations in the symptoms of the disease, I am convinced will be readily granted by any one who peruses the account of the cases referred to in the Table. The pathological condition of the bones in all will be found essentially the same, as well in Cases 2 and 7, in which the bones crumbled beneath the fingers, as in Case 4, in which they are described as being "as limber as a rag;" these physical properties being dependent solely upon the difference that exists in the relative proportions of the earthy and animal constituents.

Dr. Bostock's analysis of the bones in this disease

is the only one that has been hitherto published; its value, however, is much diminished, in consequence of being unaccompanied with the particulars of the case, the bones of which were the subject of examination. Mr. Pereira has obliged me by examining a portion of the radius in the case of Catherine Burne. The following results were obtained by incinerating seventeen grains:—

Earthy matter	7	4
Animal matter and water (not got rid of by drying)	9	6
	17	0

A portion of a healthy ulna, from a subject about the same age, yielded the following results:—

Earthy matter	10	0
Animal matter and water (not got rid of by drying)	7	0
Average of two experiments	17	0

The bone which was here the subject of examination was in an incipient state of atrophy, but the result corresponds, as far as could be ascertained, with the state of the bones of the lower extremities. For the disproportion in the ratio of decay between the earthy and animal constituents was not sufficient to admit of distortion without fracture; and that the latter did not take place at an earlier period in the bones of the inferior extremities, which were so greatly wasted, must be attributed to the paralytic state of the muscles. The difficulty of depriving what little osseous tissue remained of the adipocire, into which

the medulla became converted on maceration, was the reason why the bones of the lower extremities were not examined chemically. It appears that the proportion of earthy matter was in this case a little more than two-fifths, being double the amount obtained from the vertebra analysed by Dr. Bostock, where it was about one-fifth. Although different bones may sometimes be found to yield different results, according as the atrophy may have advanced, I am inclined to believe that the disease usually progresses as it commenced, that is to say, that the hard and soft materials waste nearly, if not exactly, in the same ratio throughout. But I apprehend, that a better acquaintance with the composition of the bones in the different stages and varieties of this disease, however desirable to complete its history, will effect but little in illustrating its pathology, and that we must look to the blood, or to the vascular system, for further light respecting the source and cause of this morbid action.

When the humoral pathology was in vogue, mollities ossium was attributed to a dissolving quality in the medulla, because "those bones are most dissolved which contain most marrow in their cavities."* Mr. Wilson, after describing the appearance presented by the medulla in Case 9, observes, "these substances appeared to have produced absorption of part of the bone from their enlargement and internal pressure; for in some places the external

* Gooch, Practical Treatise on Wounds and other Chirurgical Subjects. Norwich, 1777.

surface of the bone was removed, and tumours allowed to extend through the openings." This explanation is unquestionably erroneous, for if the disease were consequent upon pressure from within, not only would the animal and earthy constituents be removed equally, as happens in all the examples of atrophy of bone from pressure or friction hitherto remarked, but the thin, reticular, and more vascular parts would suffer before the dense and more compact tissue; for the same reason that when the blood is propelled against various structures, in aneurism, the more vascular parts disappear first, the muscles before the bones, and the bones before the ligaments and cartilages. It is true that the wasting of the osseous tissue is accompanied with hypertrophy of the medullary tissue, which is not a cause, but only ensues as a consequence, on the same principle that, in atrophy of the kidney, a void is prevented by an increased deposition of fat; and no pathologist has ever thought of attributing the wasting of this organ to the pressure of the surrounding adipose tissue. Precisely in the same way must be explained the greasy state of the bones in old people; for as we cannot conceive that a vacuity would be left in the centre of the bone, as the decay natural to advanced life goes on, the bony matter is progressively supplied by an increase in the medulla, although it is well known that at this period of life there is anything but a tendency in the system at large to adipose formations.

The various appearances presented by the medulla, which is sometimes described as vitiated, or as being

of a reddish colour, and resembling flesh, liver, or tallow, is owing to slight modifications in the secretion, together with some degree of increased vascularity in the medullary membrane, or to the medulla being mixed up with blood accidentally effused, as would readily happen if there was much distortion. This point has been carefully looked to in the bones that I have had the opportunity of examining, and I am satisfied that the matter with which the bones are filled in this disease is nothing else than an increase of the true medulla, somewhat altered in appearance, but very slightly in its essential characters.

Nothing remarkable has been noticed in the course of the medullary artery. In the bones of Catherine Burne, and in the humerus preserved in the Hunterian Collection, which is minutely injected, the medullary membrane seemed to be well supplied with vessels.

Mr. Howship* remarks in reference to this disease, that it is "the effect of a morbid action in the capillary arteries upon the medullary membranes within the bone; and most probably the progressive absorption of the bone itself was merely one of the consequences of the long continuance of the malady." But from reviewing all the circumstances connected with this and other forms of atrophy of bone, I think we may be fairly justified in concluding, that the wasting of the osseous tissue is here the result of defective nutrition, and not of increased activity in absorption. If it were owing to the latter action, we should expect that the wasting process would go on most rapidly in the cancellous

* Edinb. Medico-chirurgical Transactions, Vol. II.

and vascular parts of bone, whereas we find that the denser parts and those of inferior vascularity are most rapidly removed. Again, the disease appears first in the bones of the lower extremities, for the same reason, probably, that all morbid changes consequent upon defective nutrition or a feeble circulation commence oftener in these depending parts.

The atrophy of the bones natural to old age, which commences in the neck of the femur, a part of the osseous system, which it has been argued, is less capable of maintaining its vascularity and less provided with the powers of repair, is invariably attributed in these parts as in the body generally to defective nutrition. Now there is a very striking analogy between the disease under consideration and the decay which occurs in advancing years. In both, the lesion is more remarkable in females than in males, and in both the atrophy is chiefly *eccentric*, and the interior of the bones is filled up with an increase in the medulla. In some instances it would appear, that this change is most marked in the same part of the osseous system. Thus, in Case 11, it is stated, that the necks of the femurs had entirely disappeared, and that the heads of these bones were attached to the bodies only by the articular fibrous capsules; and in Case 12, it is described, that the bones were soft and almost everywhere exhibited a fine areolar tissue of a greyish-white colour, containing a quantity of gelatiniform deposit, but that at the end of the femur the osseous structure had degenerated into a reddish

detritus. We likewise find that the decay of old age is subject to slight modifications; that in some instances the earthy parts are removed faster than the animal constituents, whilst in others, the reverse is observed. The atrophy of old age, however, never advances so far as in this disease; and, as there is generally a superabundance of the phosphates in the system, it is more commonly attended with fragility than softening.

Mollities ossium, then, is in every respect a premature decay of the osseous system, but its cause must be different from that which operates in old age, and of this we have little or no accurate knowledge. It has been shewn that the most important organs have usually been found in a healthy condition, which forbids our ascribing it to a malignant, scrofulous, or venereal taint. In Case 5, we find that for two years before the disease commenced the patient had been in the habit of eating a pound or a pound and a half of common salt in the course of a week, without any vehicle. It appears that the disease is frequently attended with symptoms of a remarkable kind. Thus, in Case 5, it was noticed that when the bones were softening, the urine deposited a white chalky sediment, which came away after her pains and ceased towards the termination of this protracted case, when scarcely a bone remained for the disease to prey upon. Both the urine and saliva stained the linen black. In Case 15, for the first two years of the disease, the urine deposited a whitish sediment, which, upon eva-

poration, became like mortar, and the patient, a shoemaker, at Wapping *, voided three or four small jagged stones some time after a complaint in his loins. In Case 16, the urine was high coloured, turbid, and fetid, and the hands and feet were constantly covered with an unctuous humour, which, as it dried, thickened into scales. In Case 10, the perspiration was abundant, and possessed an unusual fetid odour. In Case 7 there were copious sweats and an almost incessant salivation. Now all these circumstances would seem to indicate, that the blood was loaded with something which it was glad to get rid of by any of its natural outlets. Could it have been the earthy particles of bone which, not having been duly eliminated, were left superabundant in this fluid? This would be an interesting subject for examination, and it cannot but be regretted, since the disease is so rare, that there is no chemical account of these abnormal secretions. It is to be hoped, however, that in the present advanced state of chemical science, similar opportunities of investigating so important a point will never be suffered to pass.

Although in some instances (Cases 8 and 16) nothing unusual was remarked in the urine, and in others no mention of any kind is made of this secretion or of the cutaneous, yet I am disposed to regard the phenomena just alluded to as tending to evince, that

* This is the case which occurred to Mr. H. Thompson, of the London Hospital, and which attracted great notice at the time, the patient having been visited by most of the eminent medical men of the day.

the defect is not in the blood—that there is no want of the phosphates in the system generally—and these, when taken in conjunction with all the facts hitherto ascertained respecting this curious disease—the age at which it usually occurs—its being independent of any disease elsewhere—its commencing in the lower extremities, and eccentric form, &c., appear to shew, that the parts essentially at fault, are the vessels that supply both the earthy and animal constituents, the impaired function of which is first manifested in the system of the nutritious or medullary artery.

Notwithstanding its rarity, I think it sufficiently important that we should bear this disease in mind when treating pains in the limbs of an obscure character, more especially in females, since, should they unhappily prove to be the precursors of this species of *eccentric* atrophy of bone, past experience would warrant but very slight hopes of a favourable issue.

There are several well authenticated examples on record, of cancer, in which a remarkable fragility of the bones has been noticed. In some instances this is attributable to the disorganization consequent upon the development around or in the interior of the bones of the peculiar matter distinguishing this disease. In others, however, there is reason to believe that it is simply owing to *eccentric atrophy*. I have little doubt but that this was the case in one, if not in both the examples of fracture of the thigh-bone observed in connexion with cancer of the breast, described by Mr. Salter in the fifteenth volume of the Society's Transactions. But whether the atrophy in

these instances be only an accidental coincidence, or originate in a constitutional defect favourable both to the development of cancer and to the decay of the osseous system, or whether the particular cases alluded to were genuine instances of malignant deposit, are subjects which must be reserved for subsequent investigation.

A

BRIEF ACCOUNT

OF THE

SUBSEQUENT MEDICAL HISTORY

OF

MARY WREN,

WHOSE CASE IS DETAILED IN THE THIRTEENTH VOLUME OF THE SOCIETY'S TRANSACTIONS.

By Mr. BIRCH.

Communicated by Dr. BULL.

TITLE READ JUNE 7TH, 1836.

It appears that about nine months after Mr. Birch's attendance she became pregnant, and miscarried at the fourth month; that in 1831 she again became pregnant, went her full time, and was delivered of a living child, after a good and natural labour; and that she again, and for the third time since the accident of 1827, conceived in the month of October, 1834, labour occurring on Sunday, the 21st of June, 1835, and death on the following Friday.

The patient was attended in this, her last confinement, by Mr. Skinner, who called in Mr. Thorne (the

gentleman who had charge of the case in 1827) during the progress of the labour, of which he has favoured me with the following account.

"I was called in at three o'clock A.M., Sunday, the 21st of June. I found that the membranes had given way the previous Thursday, and being alarmed, she sent for Mr. Skinner; that he remained with her but a short time, and, there being no pain, did not make an examination, but that he was summoned to her assistance on Saturday night, June 20, a little before twelve. He found the uterus acting with great power and frequency, which it continued to do for three hours, and then its contractions suddenly ceased, the patient complaining of a most violent excruciating pain in the abdomen. At this time I saw her. Upon making an examination per vagina, I found the funis presenting together with a hand—the os uteri fully dilated, and the pulsation in the funis ceased. I immediately introduced my hand, and brought the feet into the vagina, and very easily made the evolution of the child. The delivery was effected with little or no difficulty, notwithstanding it was a fœtus rather beyond the ordinary size. I made no exertion in bringing the head through the superior aperture of the pelvis;—there was no hæmorrhage —no vomiting—pulse firm and regular,—nor did the countenance indicate that laceration of the uterus had again taken place. I saw her only once after this until her death, when she was evidently sinking from puerperal peritonitis."

At Mr. Thorne's invitation I opened the body, on Saturday, the 27th of June: the morbid appearances were as follows.

The whole peritoneal membrane highly inflamed. The abdominal viscera adhering to one another by coagulating lymph. The omentum of a deep red colour and highly vascular, and closely adherent to the intestines and to the fundus of the uterus. The serous covering of the uterus exhibiting signs of severe inflammation, lymph being thrown out in a thick layer over the fundus and part of the body. The broad ligament, the ovaria, and Fallopian tubes highly inflamed, and partially imbedded in lymph and pus.

The whole of the pelvic viscera being removed, a lacerated opening was found extending across the cervix uteri in its anterior part, and dipping into the sides of the uterus also; the edges of the wound extremely ragged,—without granulation, and no attempt at union apparent.

Upon the most careful inspection I could not discover any cicatrix of the former rupture, and have reason to believe, from the evident *cause* of the accident in *both* occasions, it must have taken place precisely in the same spot as the present laceration.

A very prominent linea ilio-pectinea, together with a brim below the average size, would appear to have been the *immediate* cause.

The dimensions were as follows:—

Antero-posterior diameter . . 3 in. 2 lines.
Diagonal diameter . . . . 4 in. 3 lines.
Symphysis pubis very prominent within; and
The lineæ ilio-pectineæ raised full two lines, and exceedingly sharp at their edges.

CASE

OF

REMOVAL

OF

A PORTION OF LUNG

WHICH PROTRUDED THROUGH A WOUND;

ETC.

By W. FORDE, Esq.

Communicated by Sir JAMES MACGRIGOR, Bart.

TITLE READ JUNE 7TH, 1836.

A Fingo, of athletic make and in good health, aged about thirty-five years, in an engagement with the Caffers, at the Tabendoda mountain, on the 28th of June, was transfixed by an azigai through the right side; the weapon entering opposite to the eleventh rib, three inches from the spine, and the same distance from the crest of the ilium; and making its exit in the right hypochondrium, midway between the umbilicus and the cartilage of the ninth rib, the opening being three inches distant from each; and the whole course of the wound, supposing it to be in a direct line, six inches in length.

The man immediately withdrew the shaft of the azigai through the anterior opening, and with it

dragged forth a considerable portion of his lung. He was soon afterwards picked up by some waggons which happened to pass, and a greased rag having been applied to the part, he was conveyed to the camp early on the following day. When brought to me, his respiration was slightly oppressed and impeded, he inclined to the right side, but did not complain of pain. The piece of lung protruded was about five inches in length, and of considerable thickness, and the opening through which it had escaped, being merely an incision three fourths of an inch in length, reduction of the part was impracticable without considerable dilatation being practised, a measure which, from the situation and nature of the wound, I deemed extremely hazardous, if not impossible. But the attempt to return the lung into its natural situation was unadvisable, its texture and serous covering having been much lacerated by the man's own endeavours to tear it away; I therefore determined on its removal, for which purpose I applied a ligature tightly round it, close to the integuments, and bringing the edges of the wound together by means of a strip of adhesive plaster, left the protruded lung undivided, until the process of adhesion should take place and prevent one of two evils, which might have occurred had it been cut off immediately it was tied; namely, either that by the motions of the thorax and expansion of the lungs, the constricted part might have been drawn into the pleural cavity, conveying with it the ligature; or that the latter slipping off and the lung

receding, hæmorrhage into the sac have been the consequence.

On the third day, the desired adhesion being perfect, and the separation nearly effected by the ligature, the piece of lung was cut off with scissors, and both openings dressed with adhesive straps. From this moment there was not one untoward symptom, and the only medical treatment necessary consisted in giving one dose of Epsom salts; for a few days there was a healthy discharge from the opening in the back, which gradually ceased and the wound granulated; at the expiration of a fortnight the whole had healed, the man had quite recovered, and he can now run, throw his azigai, and perform any other active feat as well as any of his most agile companions.

Reflecting on the situation of the openings caused by the entrance and exit of the weapon, and the apparently direct course in which it had passed, it might appear impossible that protrusion of a portion of lung, or a wound in any part of the thoracic parietes could have occurred; and one would reasonably suppose a wound of the liver, ascending colon, or omentum, as more likely to be the consequence. I confess I am at a loss to account for the protrusion of a piece of lung (and lung it most decidedly was, having been carefully examined by assistant surgeon Bickersteth and myself, and its texture and appearance could not easily be mistaken) in the centre of the right hypochondriac region, as connected with the apparent course of the wound, unless it be assumed

that at the moment it was inflicted, the man had been in some extraordinarily crouching position.

Of necessity the diaphragm, with its pleural and peritoneal coverings, must have been perforated, and yet the man recovered without a single symptom of pleuritic, peritoneal, or pulmonic inflammation.

WILLIAM M. FORD,
Assistant Surgeon, 72d Highlanders
in Medical Charge.

King Williamstown,
Province of Queen Adelaide,
South Africa.
August 10th, 1835.

EXPLANATION OF THE PLATES.

PLATE I.

FIG. 1.—Represents the appearance mentioned at page 7, of the spinal marrow of a man of middle age and good health, who was executed a few years ago at Norwich. The drawing was taken about four hours after the execution. The sheath is slit down, and thrown aside; and the vessels are seen through the membranous investment of the medulla. The usual appearances of vascularity were exhibited in the other internal membranes.

Fig. 2.—Represents the appearance of the spinal marrow, divested of its sheath, of a man of twenty-nine, a weaver by trade, who died in the Norfolk and Norwich Hospital, on the 3d day of October, 1836, of extensive tubercular disease of the lungs, and was examined the following day. He had the usual symptoms of pulmonary consumption, with considerable pain in the larynx and trachea; and for several days before his death, was affected with very great dyspnœa, but without suffusion of countenance. As an opportunity was allowed me of removing a portion of the spinal marrow, I had a drawing immediately made of it, which I substituted for a second

drawing from the same subject as No. 1, subsequently to the printing of my paper. This I did, thinking that it would be in further illustration of the object of my communication, to give the spinal appearances in a case of natural death, where no affection of the column or head existed during life; and the figure seems to exhibit a fair average appearance of the medulla spinalis, in cases of ordinary natural death.

PLATE II.

Fig. 1.—Represents the patient, Mrs. Fraser, previous to the operation. Her case is detailed, p. 186.

Fig. 2.—Represents the patient, M. Griffiths, p. 198, note. Two teeth are delineated in this plate with tumours attached to the apices of the fangs. Reference is made to this disease, p. 168.

PLATE III.

Fig. 1.—Represents Mrs. Struther before the operation; and

Fig. 2.—Represents the same individual three weeks after the removal of the tumour; Case detailed p. 189.

PLATE IV.

Exhibits the eccentric atrophy of that portion of a fractured bone deprived of its supply of blood from the nutritious artery.

Fig. 1.—Section of a humerus fractured above the entrance of the nutritious artery;—from a preparation in the Museum of St. Thomas's Hospital, No. 800.

a Atrophied end of the bone.

Fig. 2.—Section of a femur fractured below the entrance of the nutritious artery;—from a preparation in the Museum of St. Thomas's Hospital, No. 793.

b Atrophied end of the bone.

PLATE V.

Exhibits the altered shape and depression of the os humeri from the atrophy of old age;—from a preparation in the collection at the London Hospital.

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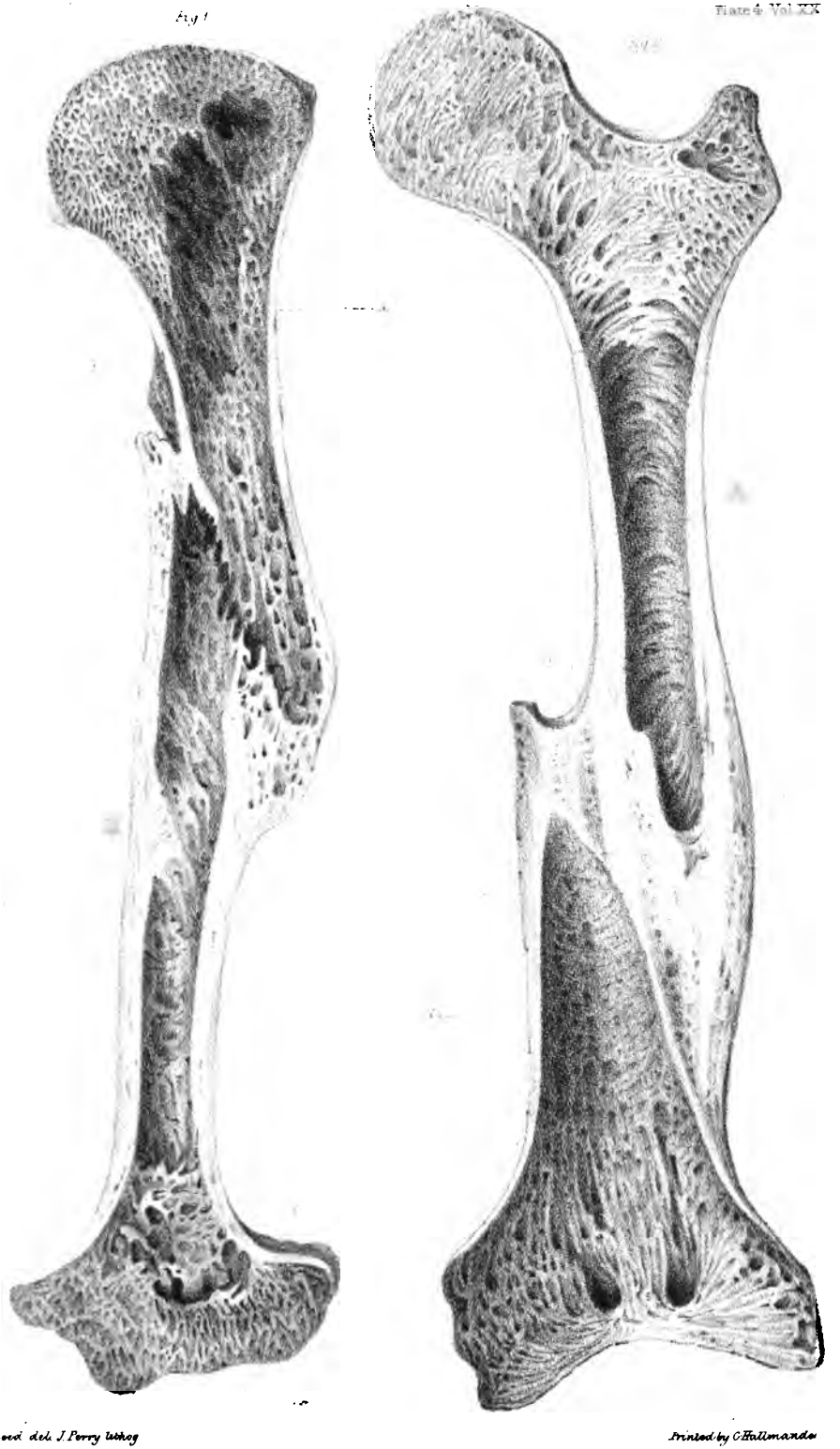

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